

OPERATION & MAINTENANCE MANUAL

Prevacuum Steam Heated Autoclave
with Steam to Steam Generator
and Vertical Sliding Door
model 6690 STS-1V

S/N: 2301006, 2301007, 2301011, 2301012, 2301013,
2301014, 2301015, 2301016, 2301017, 2301018

Table of Contents

Incoming Inspection	1
1. General Information	
1.1 Introduction	2-3
1.2 Standards	3
1.3 Specifications	4
1.4 Steam Data	4
2. Functional Description	
2.1 The Steam to Steam Generator	5
2.2 The Water Pump	5
2.3 The Piping System	6-7
2.4 The Pneumatic Control System	8-9
2.5 The Water Quality	10-11
2.6 The Electric System	12
2.7 Control System	13-15
3. Sterilization Programs	16-39
4. Control and Monitoring	
♦ Control Panel 'CAT 2007'	40
4.1 Description of panel 'CAT 2007'	41
4.1.1 Keypad	41-42
4.1.2 Display	43-44
4.2 Description of Displayed Messages and Safety Measures	45-46
4.3 Operating the Control Panel	
4.3.1 Starting up the system	47
4.3.2 Selecting a Cycle	48-50
4.3.3 System Setup	51-53
4.3.4 Changing cycle parameters	54-58
4.3.5 Test Programs	59-60
4.3.6 Display function	61
4.3.7 Display during a cycle	62-63
5. Calibration	64
5.1 Calibrating temperature and pressure	65

Table of Contents

5.1.1 Temp 1 -----	65
5.1.2 Temp 2 -----	66
5.1.3 Temp 3 -----	66
5.1.4 Temp 4 -----	66
5.1.5 Chamber Pres -----	66
5.1.6 Jacket Pres -----	66
5.1.7 Gen Pres -----	66
5.1.8 D1 Pres -----	66-67
 6. Transportation of the Autoclave -----	68
 7. Preparation before Sterilization -----	69-70
♦ Loading and Unloading -----	70
 8. Installation Instructions -----	71-72
 9. Operating Instructions -----	73
♦ Control Panel -----	74
 10. Printer	
10.1 Printer Operation -----	75-76
10.2 Printer Handling -----	77
 11. Maintenance of the Autoclave	
11.1 Preventive and Periodical Maintenance -----	78
SERVICE INSTRUCTIONS	
11.2 Safety Tests after Repair -----	80
11.3 Troubleshooting -----	81-85
11.4 Troubleshooting for the Water Pump 'SHURFLO' -----	86
11.5 Pressure Switch -----	87
11.6 Absolute Pressure Transducer -----	88
11.7 Cleaning and replacing the Water Level Electrodes -----	89
11.8 The GEN - PROTEC electronic board -----	90
11.9 Water Pump Rear Endbell Replacement Kit -----	91-92
11. 10 Door Oil Piston -----	93
11.10 Dismantling the Cabinets side panels -----	94

Table of Contents

12. Spare Parts	95-96
------------------------	--------------

13. Valves Numbering	97-98
-----------------------------	--------------

14. Pressure and Temperature Table for Saturated Steam	99
---	-----------

Drawings

♦ The Pneumatic Control System Drawing	9
♦ Vertical Sliding Door	100
♦ Vertical Door- Locking Mechanism	101
♦ Piping drawing	102
♦ Electric drawing for the Autoclave	103

XPCS Manual	104-117
--------------------	----------------

♦ Steps for modem connection	117
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INCOMING INSPECTION

The instruments (products) should be unpacked and inspected for mechanical damage upon receipt. Observe packing method and retain packing materials until the unit has been inspected.

Mechanical inspection involved checking for signs of physical damage such as: scratched panel surfaces, broken knobs, etc.

If damage is apparent, file a claim with the carrier. The manufacturer is responsible for products shipped F.O.B. These products are carefully inspected prior to shipment and all reasonable precautions are taken in preparing them for shipment to assure safe arrival at their destination.

WARRANTY

We certify that this instrument is guaranteed to be free from defects in material and workmanship for one year against faulty components and assembly with the exception of glassware, lamps and heaters.

The warranty does not include and does not replace routine treatment and preventive maintenance to be performed according to instructions in paragraph 11.1 'Preventive and Periodical Maintenance'.

Our obligation is limited to replacing the instrument or parts, after our examination, if within one year after the date of shipment they prove to be defective. This warranty does not apply to any instrument, which has been subjected to misuse, neglect, accident or improper installation or application, nor shall it extend to products, which have been repaired or altered outside the factory without prior authorization from us.

The Autoclave should not be used in a manner not described in this manual!

Note

If there is any difficulty with this instrument, and the solution is not covered in this manual, contact our representative or us first.

Do not attempt to service this instrument yourself.

Stipulate *the model* and *serial number* and describe the difficulty as clearly as possible so we may be able to diagnose the problem and hence provide a prompt solution.

For technical information or service please contact our representative at:

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1. GENERAL INFORMATION

1.1 Introduction

This autoclave is a pre-vacuum sterilizer designed to cover a large field of applications for hospitals and medical centers as well as pharmaceutical and biotechnological industries.

The autoclave operates with saturated steam as the sterilizing agent, and has a temperature of up to 279°F and pressure up to 40 psi.

The autoclave is constructed of stainless steel, having a double - walled structure and is equipped with a steam to steam generator, which supplies clean steam to the chamber for the sterilization process. There are separate steam lines from the steam to steam generator to the chamber and from the building steam supply to the jacket.

The autoclave is equipped with one vertical sliding door operated by a hydraulic system, through two oil cylinders mounted laterally on both sides of the door. The command pressure of compressed air is transmitted to the oil in the cylinders and converted into hydraulic pressure, which pushes the pistons up or down, for closing or opening the door.

The sealing of the chamber is achieved through a heat resistant silicone gasket, located in a groove on the front side of the autoclave. The gasket is pushed against the door by steam pressure introduced in the groove, behind the gasket.

Twelve sterilization programs are available, four are intended for unwrapped instruments (gravity), four for wrapped instruments and packages and four for liquids. Two test programs are also available, the VACUUM TEST for checking the tightness of the chamber and piping system and the BOWIE DICK test enabling to check the efficiency of the sterilization process.

The control system of the sterilizer is based on " State-of -the -Art" microcomputer technology, ensuring a highly reliable and safe operation. The computerized control unit ensures a fully automatic operation through the entire cycle, hence after setting the pre-selected data and starting the operation, no further intervention is necessary.

The selected program, the main phases of the cycle and the status of the machine are controlled and displayed on digital readouts. For process documentation, the important information concerning operation is printed in hard copy.

For optimal control accuracy of the sterilization parameters, the system is equipped with three temperature sensors, three pressure transducers and a pressure switch having the following functions:

- ◆ The temperature sensors: 2 measuring the condense temperature (control and printout) and the drain control output.
 - ◆ The pressure transducers: the chamber pressure (control and monitoring), the jacket pressure (control) and gasket pressure.
 - ◆ The pressure switch regulates the steam pressure output of the steam generator.
- Four pressure gauges measure the gasket, jacket, chamber and steam generator pressure.

A programming mode, which can be entered by an access code, enables the technician to set a number of additional parameters and operation modes.

The keyboard located on the front panel enables the operator to start and stop the cycle.

Only the responsible person has access to select the program and change the major parameters by using the key.

Optionally, a personal computer can be connected to the control system, through the interface board RS232, which can be, operated 8 meters away from the autoclave. The PC, operating under WINDOWS displays the status, data and processing in real time in graphic and digital form at the same time recording and logging the data. The communication PC-control unit enables the complete control of the autoclave through the PC, including program selection, starting and stopping the cycle, setting of parameters and the real time clock (data and time of the day).

1.2 Standards

This autoclave meets applicable requirements of the following standards:

1. A.S.M.E. Code, Section VIII Division 1 for unfired pressure vessels.
2. HTM 2010 – Sterilization and HTM 2031 - Clean Steam for Sterilization.
3. Complies with AAMI/ANSE ST8- Hospital Steam Sterilizers.
4. Complies with Underwriters Laboratories (U.L 2601-1) requirements

Tuttnauer is approved for ISO 9002 (Quality Systems), EN 46002 (Quality Systems for Medical Devices) and ISO 13488 (Quality systems for Medical devices – Particular requirements for the application of ISO 9002).

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1.3 Specifications

Product data		Model 6690 – 1V
Chamber Dim.	W	26'' (660 mm.)
	H	26'' (660 mm.)
	D	36'' (1070 mm.)
Chamber volume		467 l.
External dim.	W	1215 mm.
	H	1990 mm.
	D	1450 mm.
Net Weight		1150 kg (2540 lb)
Degree of protection		IPX 4

Utilities		
Steam supply		1'', 50-80 PSI, 160 Lbs/Hr Peak 88 Lbs/Hr Avg.
Cold water supply Maximum hardness value 72-215 TDS of CaCO ₃ Recommended temperature 59°F		¾'', 50-80 PSI, 12.5 GPM Peak 275 GPH Avg.
Compressed air requirements		Pressure 90-110 PSI, 3.5 SCFM 3/8" thread connection.
Electrical data:		
Voltage		1 ph, 115V/60Hz
Current	Utility	10 A
	Consumption	6A

1.4 Steam Data

Working pressure	4 Bar (59 psi)
Test pressure	15.5 Bar (228 psi)
Safety relief valve	5 Bar (75 psi)

Plant Steam (Input)			Generated Steam (Output)		
pressure (bar)	Temp. (°C)	Rate Kg/h	pressure (bar)	Temp. (°C)	Rate Kg/h
8	176	137	2.6	140	116
7	171	88	2.6	140	80
6	165	52	2.6	140	47
5	159	24	2.6	140	22

2. FUNCTIONAL DESCRIPTION

2.1 The Steam to Steam Generator

The steam for the sterilization process is supplied from the building main steam supply to a built in steam to steam generator, which produces clean steam and is directly connected to the autoclave chamber.

Water to the steam generator is supplied by a single-phase pump, from a water reservoir, which is connected to a source of distilled or mineral free water.

A water level control system, consisting of two electrodes mounted on top of the boiler and connected to the electronic control board maintains through the pump and a solenoid valve, a constant water level and ensures a safe operation of the steam to steam generator.

A pressure switch connected through the electronic board regulates the output steam pressure. A safety relief valve blows off at a pressure of 40 psi, to prevent build-up of overpressure in case of control failure.

Only mineral - free water or distilled water will be used for operation of the generator. See also par. 2.5 'Water Quality'.

2.2 Water Pump for the Steam Generator

The suction of the pump is connected to the water reservoir filled with mineral-free water and mounted on the side of the autoclave. The mineral water is heated to 80°C and maintained at this temperature so that the steam obtained from this water has a low content of non-condensable gases. A PT100 temperature sensor controls the water temperature.

A float valve keeps a constant level of water and prevents an overflow of water out of the reservoir.

A lower float switch stops the operation of pump and heaters, when the water level drops below this switch.

The Vacuum Breaker

When the generator cools down, it generates vacuum inside.

The vacuum breaker breaks it so that the generator won't draw water from the mineral free water reservoir.

2.3 The Piping System

The piping system of the autoclave consists of air-operated ball valves, which control the water, condensate and steam flow in and out of the chamber, operate the vacuum pump, and the air inlet valve. The air pulses to the pneumatic valves is transmitted through solenoid pilot valves, operated at 24VDC.

The functions of the valves are as follows:

Air-operated valves

Steam to jacket (91); introduces steam from outer source to jacket, to heat the jacket during the sterilization phase.

Steam to chamber valve (93); introduces clean steam from the steam to steam generator into the chamber, for heating and maintaining the chamber temperature during the sterilization phase.

Steam inlet to the generator valve (95); introduces steam from the building steam supply into the steam to steam generator for producing clean steam.

Air inlet valve (43); introduces filtered atmospheric air at the end of the cycle to break the vacuum and enable the opening of the door.

Fast exhaust to drain valve (73); evacuates the steam from the chamber to drain at a fast rate, until pressure goes down to zero, in the prevacuum and post - sterilization phases.

Condense valve (74); evacuates the condense from the chamber in the heating and sterilization phases and isolates the chamber from the drain pipe during the vacuum generation. It operates like a slow exhaust valve at the end of the liquids program.

Exhaust to ejector valve (75); works together with the vacuum valve and connects the chamber to ejector to create vacuum in the chamber.

Feed water to ejector valve (15); controls the flow of water through the ejector to produce vacuum in the prevacuum and dry stages.

Mineral free water inlet valve (21); flows water from the mineral free water reservoir and prevents hot water to return from the steam to steam generator to the reservoir.

Drain cooling valve (13); flows water to drain, to cool the drain during the steam and condense evacuation.

Pressure to gasket valve (94); controls the compressed air pressure to the door gasket. When the door is closed, air enters through the valve into the groove behind the gasket pushing it against the door to seal the chamber.

Vacuum to gasket valve (53); connects the gasket groove to the ejector. While the door is moving during the opening or closing - the valve is open and vacuum is produced to pull the gasket inside the groove, ensuring the smooth sliding of the door. When the door is open, this valve is operated but vacuum is not produced. The commands of the two valves are achieved by means of two solenoid valves. The two valves work in opposition, at any moment when one of them is open the other is closed, as described above.

Solenoid - Operated Valves

Besides the pilot solenoid valves which control the air - operated valves, the following solenoid valves have direct action as described below:

Close door valve(39); is a solenoid valve which transmits compressed air to the door cylinders for closing the door.

Open door valve(38); is a solenoid valve which transmits compressed air to the door cylinders for opening the door.

Air supply valve (31); is a solenoid valve which transmits compressed air to the manifold branch solenoid battery for the command of pneumatic valves. It ensures that the valves control and doors driving are active, only if the electrical power supply is present.

Note: The valves numbers are in accordance with the valve numbering list and piping diagram at the end of the manual.

2.4 The Pneumatic Control System

The control of the pneumatic valves is done through compressed air, as described below:

The pneumatic valves are air-air control type, fitted with two commands, an opening command received through solenoid valve at a pressure of 6 bars - output by the control system and a permanent closing command at a pressure of 3 bars, connected to all valves.

The pneumatic control system is built as follows (refer to drawing on the next page).

The incoming compressed air supply at a pressure of 7-8 bars is set by means of a pressure regulator at 6 bars and transmitted to the entrance of the pilot solenoid valve battery.

The solenoid valve battery is mounted on a manifold branch base, through which all the solenoids are connected to the compressed air supply.

At the output side of the manifold branch, a pressure regulator at 3 bars sets the compressed air.

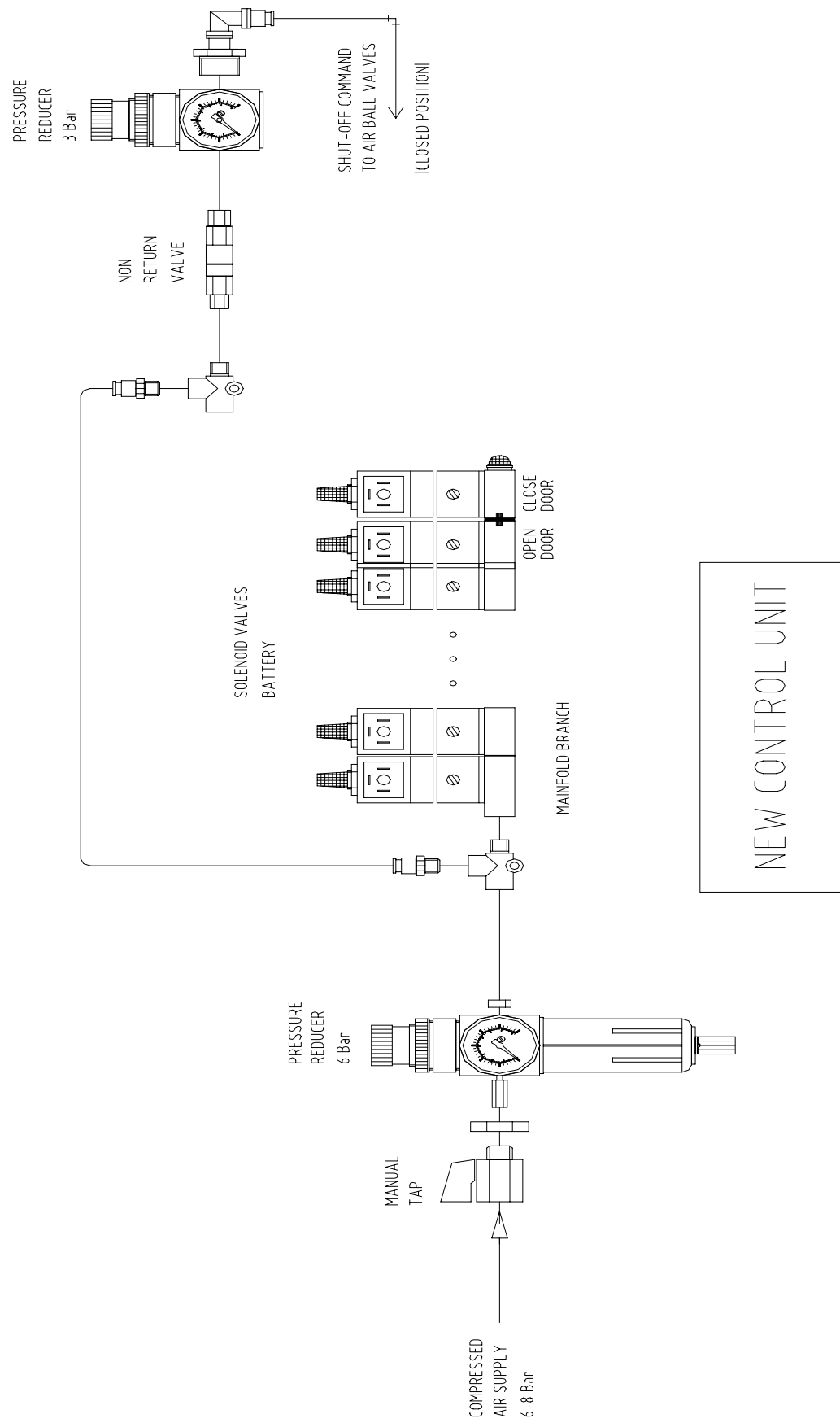
As long as a pneumatic valve does not receive from the control system an opening command the close command which is permanently present will determine the shut-off position of the valve.

When an open command at 6 bars reaches a pneumatic valve, it overcomes the opposite close command at 3 bars, and sets up the valve in position open.

A non-return valve mounted between the outlet side of the manifold branch and the pressure reducer prevents the flow of air from the air reservoir to the solenoid battery.

One safety measure is provided, a pneumatic control three-way, two-position steam activated air returned valve, to prevent the possibility of opening the door when pressure is introduced in the chamber.

PNEUMATIC CONTROL SYSTEM AUTOMATIC DOOR



2.5 Water Quality

2.5.1 Steam to Steam Generator

The distilled or mineral – free water supplied to the steam to steam generator should have the physical characteristics and maximum acceptable level of contaminants indicated in the table below:

Physical Characteristics and Maximum acceptable contaminants levels
in water or steam, for steam generator
(In compliance with ISO 11134 and ISO 13683).

Evaporate residue	< 15 mg/l
Silica	< 2 mg/l
Iron	< 0.2mg/l
Cadmium	< 0.005 mg/l
Lead	< 0.05 mg/l
Rest of heavy metals	< 0.1 mg/l
Chloride	< 3 mg/l
Phosphate	< 0.5 mg/l
Conductivity	< 50 µs/cm
pH	6.5 to 8
Appearance	colorless, clean, without sediment
Hardness	< 0.1 mmol/l

Compliance with the above data should be tested in accordance with acknowledged analytical methods, by an authorized laboratory.

Attention:

The use of water for autoclaves that do not comply with the table above may have severe impact on the working life of the sterilizer and can invalidate the manufacturer's guarantee.

The use of soft water is strictly forbidden!

2.5.2 Water for the Vacuum System and the Drain Cooling

The feed water supplied to the liquid ring vacuum pump/ejector must meet the following requirements:

- ♦ Hardness: 0.7 - 2 mmol/l, 4-12 °(German) of CaCO₃,
7.2-21°(French) of CaCO₃, 72- 215 mg/l of CaCO₃

2.5.3 Reverse Osmosis

A Reverse Osmosis (RO) system may be used to improve the quality of the water used to generate steam in the autoclave chamber.

In RO, the water is forced through a semi-penetrable membrane, which filters out contaminants to a high degree of efficiency. In deionisation (DI) ions and charged particles are removed either by electric fields or by ion exchange in resin beds.

Although the RO cannot normally attain the degree of purity possible with the DI methods, it is more than adequate for the feed water intended for clean-steam generators.

Moreover the RO has several advantages:

1. RO is cheaper to install and to run than DI.
2. RO removes particulate matter, organic molecules and pyrogens that DI cannot remove
3. RO water is less corrosive to steel and copper than DI water.
4. RO maintenance requirements are less demanding than those of the DI units.

Therefore the use of mineral free water will contribute to better performance and longer life of the autoclave.

NOTE!

Please consult a water specialist.

2.6 The Electric System

The electric system of the autoclave comprises of the power circuits, including the commands, switching and protective components, required for the operation of the electric equipment of the machine.

The following parts are located in the electric box, mounted on the side of the autoclave.

- ◆ The solid state relays for the command of the heaters, water pump and ejector.
- ◆ The circuit breakers for protection of all power circuits.
- ◆ The power supply for powering of electronic circuitry and solenoid valves.
- ◆ Two protective relays.
- ◆ The wiring and connection elements.
- ◆ The main switch.

The power circuits of the steam generator and the vacuum system are connected to the terminals in the electric box at a one-phase voltage, 1x 115V/60Hz.

It is important to achieve a steadfast grounding screw connection to the metal-sheet enclosure of the electric box and metal parts of the autoclave.

The earth installation at the customer's site must be built in compliance with the laws and regulations in force and International EN 61010-1 electrical safety standards and certified by the competent authorities.

Description of the Electrical Equipment

The command signal for the contactor is output by the micro-controller through a solid state relay. The water pump of the generator is driven by the solid state relay, the command signals are output by the micro-controller system.

The command circuits are energized by a power supply with four outputs, as indicated below:

- ◆ 5 VDC for the digital circuits.
- ◆ +12VDC and – 12VDC for the analog circuits
- ◆ 24 VDC for the solenoid valves.

The coils of the solenoid valves are connected with an end at +24V and with the other end to the control output of the controller.

The command is active; i.e. the solenoid valve is actuated when the control voltage output is low (less than 2V) with respect to ground.

Circuit breakers attain the protection of the electric and electronic circuits operated in direct current and current limiting circuits, inside the power supply stabilizers.

Two protective relays are designed to stop the pump operation in case of interruption of the other phases and save the important data from the RAM memory in case of power failure.

2.8 Control System

The Main Board

Contains the electronic microcontroller system, which controls and monitors the physical parameters of the process and performs the operation sequence of the machine according to the selected program.

The dimensions of the main board are 30x15x10cm.

The main board contains the following elements:

- ◆ 16 digital inputs
- ◆ 24 digital outputs
- ◆ 6 PT 100 inputs
- ◆ 7 Inputs of 4 –20mA
- ◆ voltage inputs for the electrode for water level
- ◆ 2 analog outputs of 4 –20mA
- ◆ Serial ports
- ◆ CPU.
- ◆ 2 ADC's for reading temperature and pressure sensors.

Each ADC maintains at least 3 temperature sensors (PT100), and 3 pressure sensors (4 –20mA).

All connections to the main board are via rigid contactors for quick, efficient and dismantling and transport.

Digital Inputs

The digital inputs are $\phi/1$:

- ◆ open/close for door positions
- ◆ safety cut-off switches
- ◆ pressure cut-off switches
- ◆ cut-off switches for water level

The input voltage will not exceed 24VDC. The input must be protected from high voltages by means of an Opto-coupler.

Digital Outputs

Digital outputs are used to activate solenoid valves, relays and SSR for the pump. The command is 24 VDC, but this will be able to be changed and allowed to move between 10-30VDC.

Each output is up to 2A, however all the outputs together will not have a capacity greater than 110 W.

Analog inputs for Reading Temperature

Temperature is measured using PT100.

The system contains 2 ADC components, each component being able to read 3 PT100 sensors. The system contains circuits with a straight connection of PT100 (3 wires) that do not interchange on the way.

The measurement range is 77-302°F (25-150°C).

The resolution range is 32.18°F (0.1°C).

The accuracy of the measure is 33.8°F (1°C).

The accuracy surrounding the sterilization temperature at the time of sterilization is in the range of $\pm 32.9^\circ\text{F}$ (0.5°C).

Calibration of the temperature circuit requires a special code.

Analog Inputs for Reading Pressure

The system contains 6 inputs for reading pressure from 4 – 20mA sensors. There are at least 3 sensors on each ADC.

The pressure reading occurs from inside the chamber, the steam entrance, and sealed doors.

Each sensor has an output of 4mA. The system allows the measurement range of the sensor to be set by external software.

Measuring pressure in chamber

The display and printing scale is in kPa.

The measurement range is 0-400kPa absolute.

The resolution measurement and display is 1 kPa.

The accuracy of the measurement is a maximum 1% from the range, i.e. 4kPa

Calibration of the pressure circuit needs a special code.

Measuring jacket pressure

The measurement range is 0-400kPa absolute.

The resolution measurement and display is 1 kPa.

The accuracy of the measurement is a maximum 1% from the range, i.e. 4kPa

Calibration of the pressure circuit needs a special code.

Measuring generator pressure

The measurement range is 100-600 kPa (absolute).

The resolution measurement and display is 2kPa.

The accuracy of the measurement is maximum 1% from the range i.e. 5kPa.

Calibration of the pressure circuit needs a special code.

Measuring the pressure of a gasket

The measurement range is 0 – 400 kPa absolute.

The resolution measurement and display is 1kPa.

The accuracy of the measurement is maximum 1% from the range, i.e. 4kPa

Calibration of the pressure circuit will need a special tool or code.

Voltage Inputs for Water Level Electrodes

Water level electrodes may be placed at a few points in the autoclave. Due the experience accumulated at “Tuttnauer”, it was determined a maximum of 3 water-level measuring points are required for the sterilization process. The points are as described below:

If the autoclave is equipped with a steam generator, 2 water level measuring point are required. The lower electrode stops the operation of the generator if the water level decreases below the minimum required to produce steam. The upper electrode controls the switching on of the water pump.

When sterilization or cooling is performed by water entering the chamber, water level measuring is required. This measuring is performed by one water level electrode.

The electrode used for measuring water level is made of a gold-coated stainless steel rod. The electrode closes an electric circuit when its tip touches the water.

4 Serial Ports

The control system contains 4 serial ports according to the following specifications:

- ◆ Serial Ports for the connection of up to 2 command panels (RS485).
- ◆ 1 Serial Port connected to an external PC computer (RS232).
- ◆ 1 Serial Port connected to an internal PC computer that will work as an activating panel (RS232).

If it will be necessary to convert some functions or to reprogram or to reload the software of the autoclave from distance, a modem can be connected using above-mentioned ports. This enables the service technicians to attend the machine from miles away, using the ADMC software thus allowing full control of the machines.

3. STERILIZATION PROGRAMS

Following are the names, relevant programs with related temperatures of the 12 sterilization cycles and 2 test programs, which are pre-set by the manufacturer.

Cycle no.	Program	Temp. °F
01-	Unwrapped	250
02-	Unwrapped	250
03 & 4	Unwrapped	270/274
05-	Wrapped	270
06-	Wrapped	270
07-	Wrapped	274
08-	Wrapped	270
09-	Liquids	250
09-	Liquids	250
10-	Liquids	250
11 & 12-	Liquids	250
13	B&D test	
14-	Leak test	

3.1 Programs description

If vacuum pulse is determined '= 0' in any program by the operator, the program can be used as a 'Gravity' program. A message 'Gravity' is displayed on the right side of the screen.

Program 1 - for Unwrapped goods (Fast 250)

This program is intended for unwrapped rigid (like instruments) and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 250°F
- ◆ Sterilization time: 15 mins.
- ◆ Dry time: 10 mins.

Performance description:

Residual air is displaced due to 3 vacuum pulses (down to 25 kPa) and 2 steam pulses up to 199 kPa. The third vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

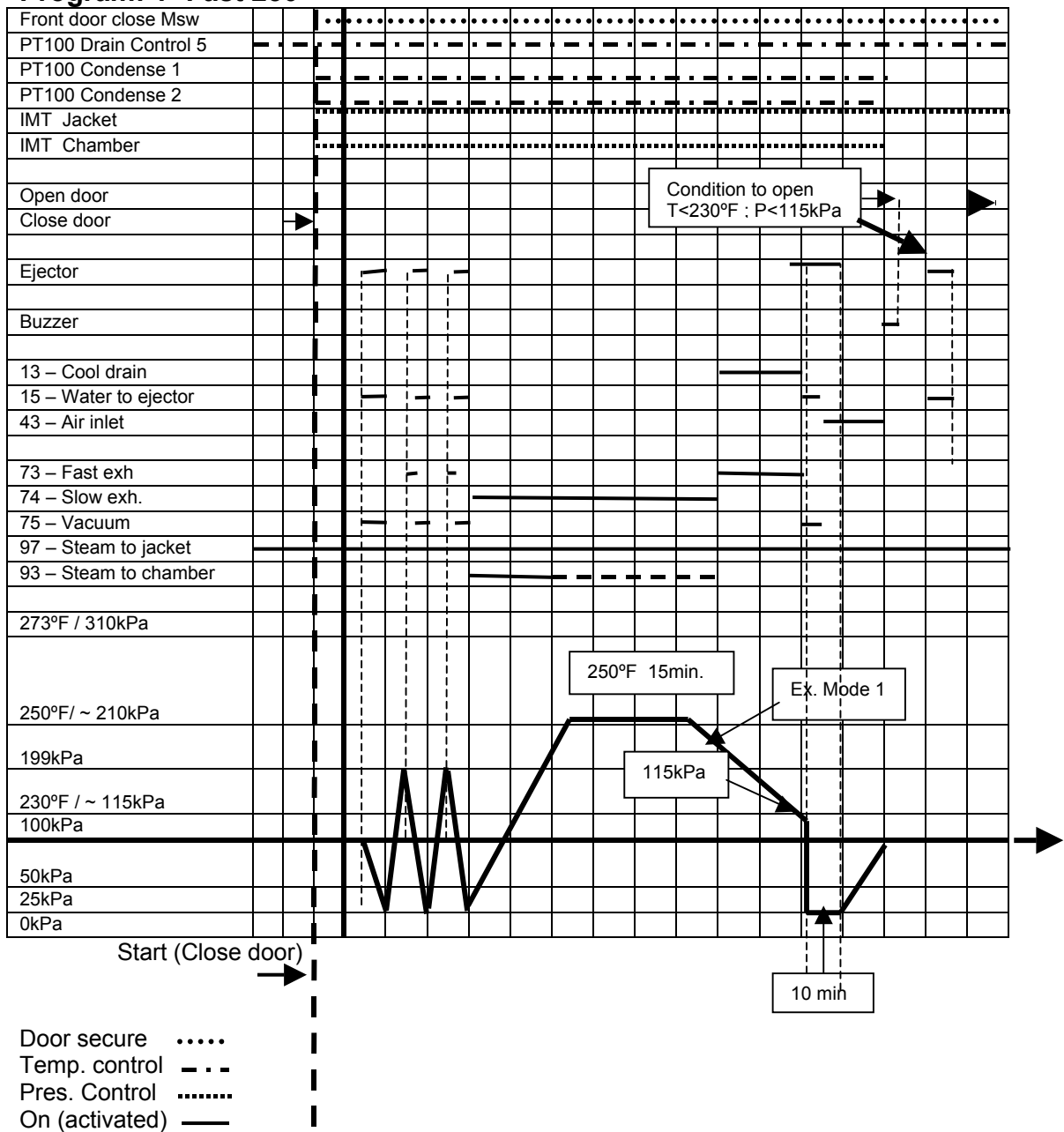
Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated until a pressure drop to 25 kPa.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 1- Fast 250



Program 2 - for Unwrapped goods (Fast 250)

This program is intended for unwrapped rigids (like instruments) and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 250°F
- ◆ Sterilization time: 15 mins.
- ◆ Dry time: 10 mins.

Performance description:

Residual air is displaced due to 3 vacuum pulses (down to 25 kPa) and 2 steam pulses up to 199 kPa. The third vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1kPa , neither an increase of 3 kPa above the high limit of the Ste. Temperature.

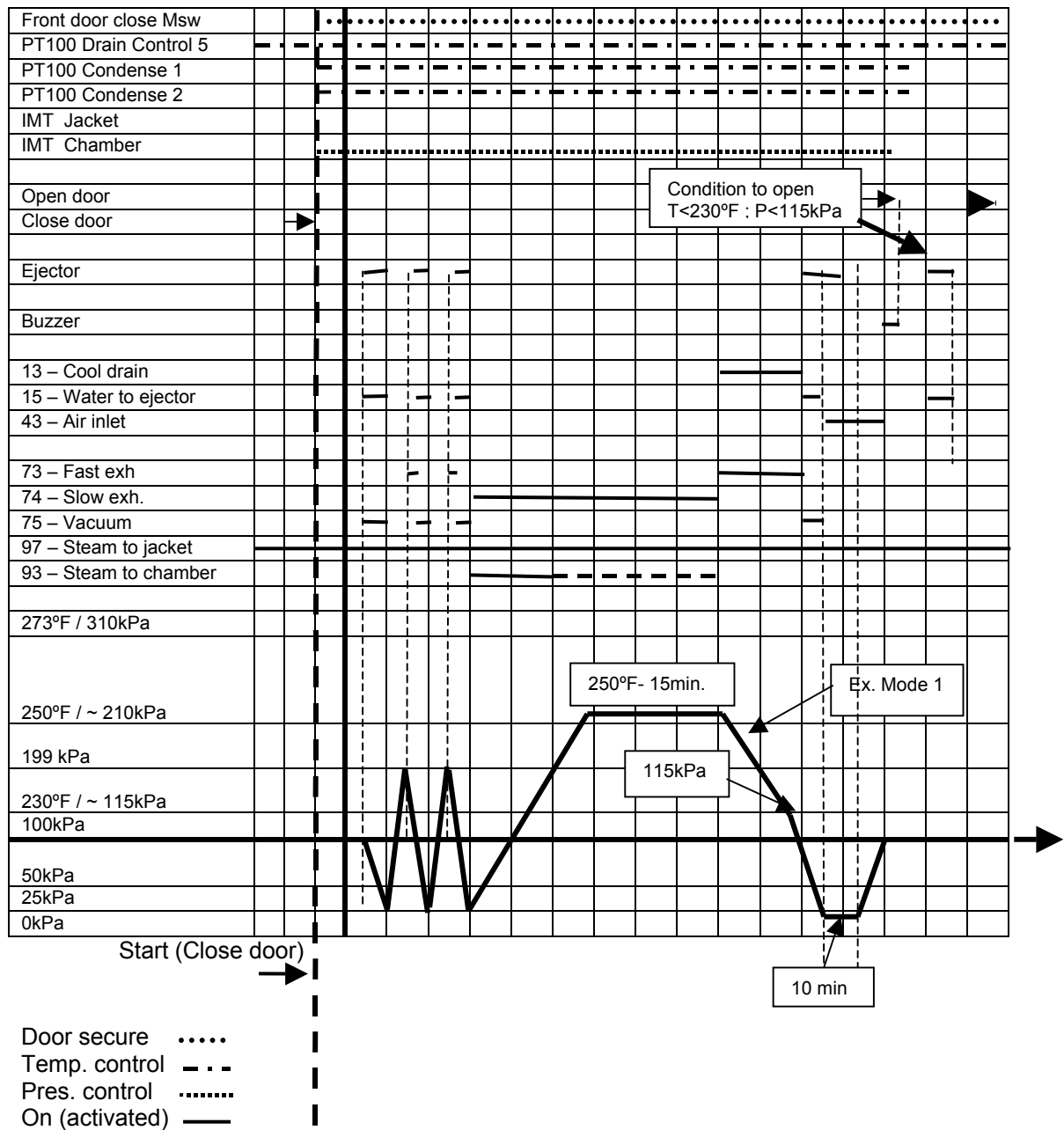
Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 2- Fast 250



Program 3 & 4 - for Unwrapped goods (Fast 270/274)

This program is intended for unwrapped rigids (like instruments) and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 270°F (for program 3) and 274°F (for program 4)
- ◆ Sterilization time: 5 mins.
- ◆ Dry time: 15 mins.

Performance description:

Residual air is displaced due to 3 vacuum pulses (down to 25 kPa) and 2 steam pulses up to 199 kPa. The third vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

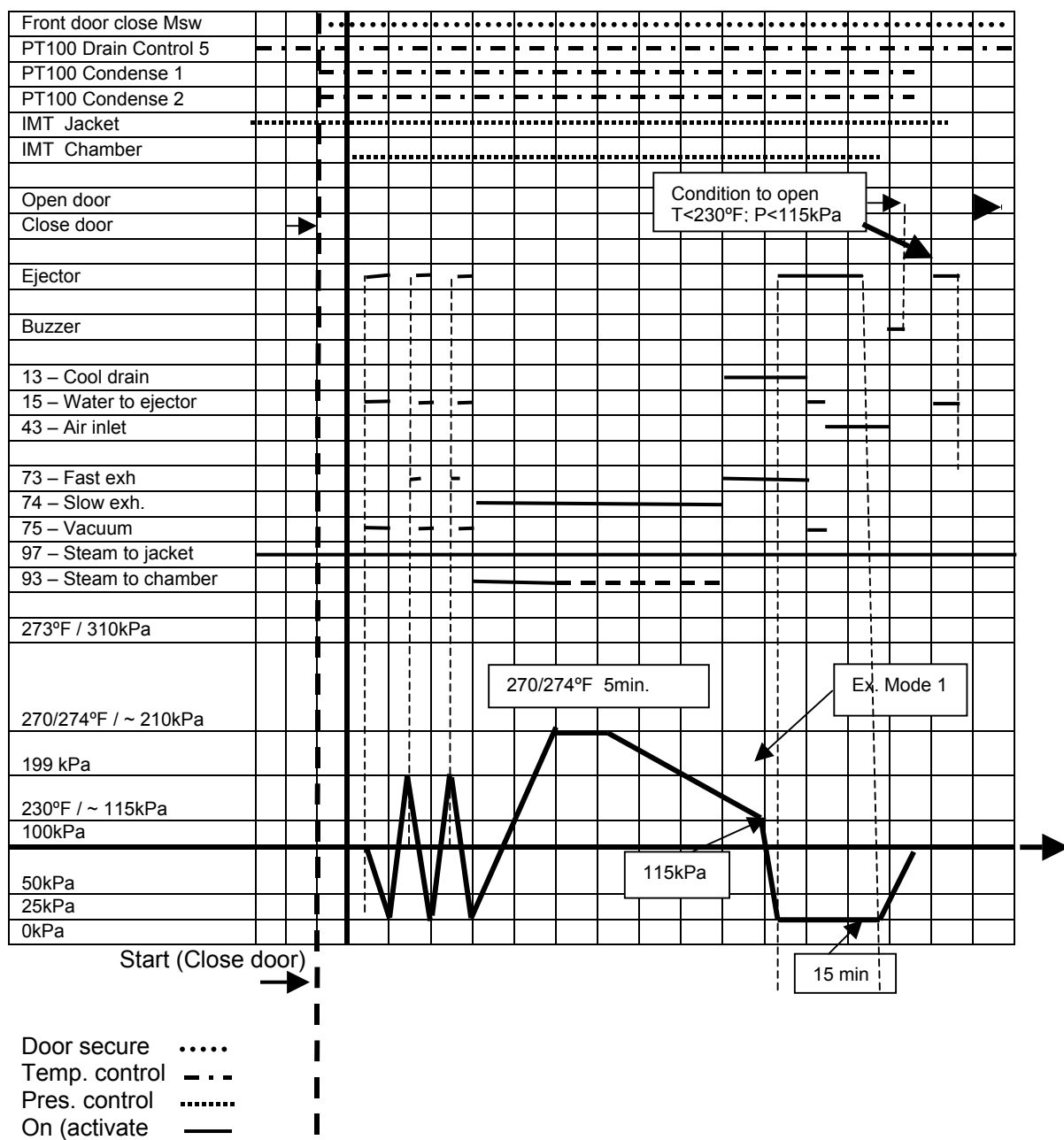
Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 3 & 4 - (Fast 270 / 274)



Program 5 - for Wrapped goods (with Dry 270)

This program is intended for wrapped materials (like instruments), porous load and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 270°F
- ◆ Sterilization time: 3 mins.
- ◆ Dry time: 15 mins.

Performance description:

Residual air is displaced due to 4 vacuum pulses (down to 25 kPa) and 3 steam pulses up to 199 kPa. The 4th vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in a way that the sterilization temperature will not drop below the required temperature, neither increase by more than 37.4°F. The saturated steam conditions are controlled in a way that the fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa.

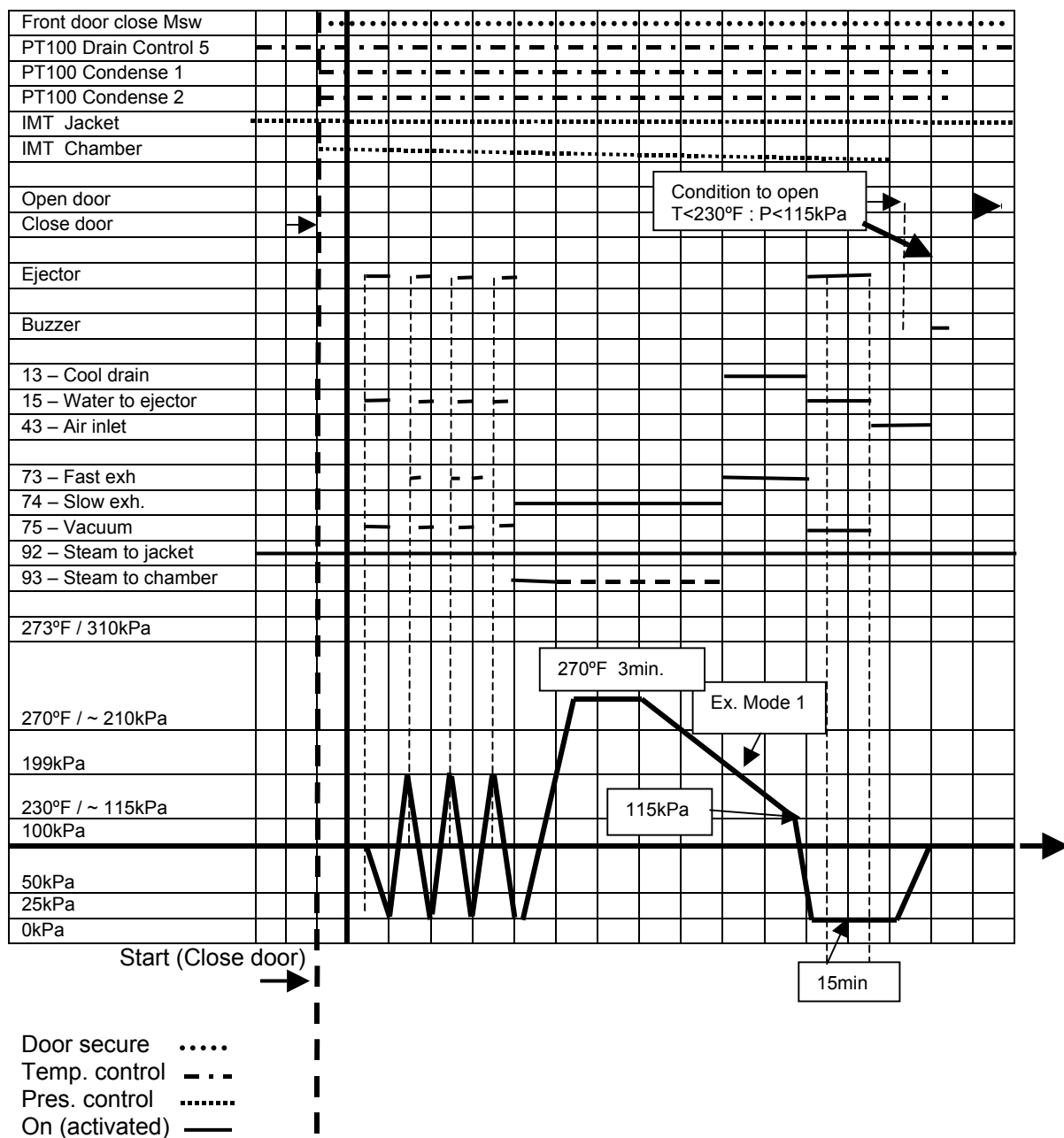
Drying is achieved by evacuating the vapor from the chamber in "under-pressure" phase along a period of 15 minutes.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 5- for Wrapped goods (with Dry 270)



Program 6 - for Wrapped goods (with Dry 270)

This program is intended for wrapped materials (like instruments), porous load and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 270°F
- ◆ Sterilization time: 10 mins.
- ◆ Dry time: 10 mins.

Performance description:

Residual air is displaced due to 4 vacuum pulses (down to 25 kPa) and 3 steam pulses up to 199 kPa. The 4th vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa .

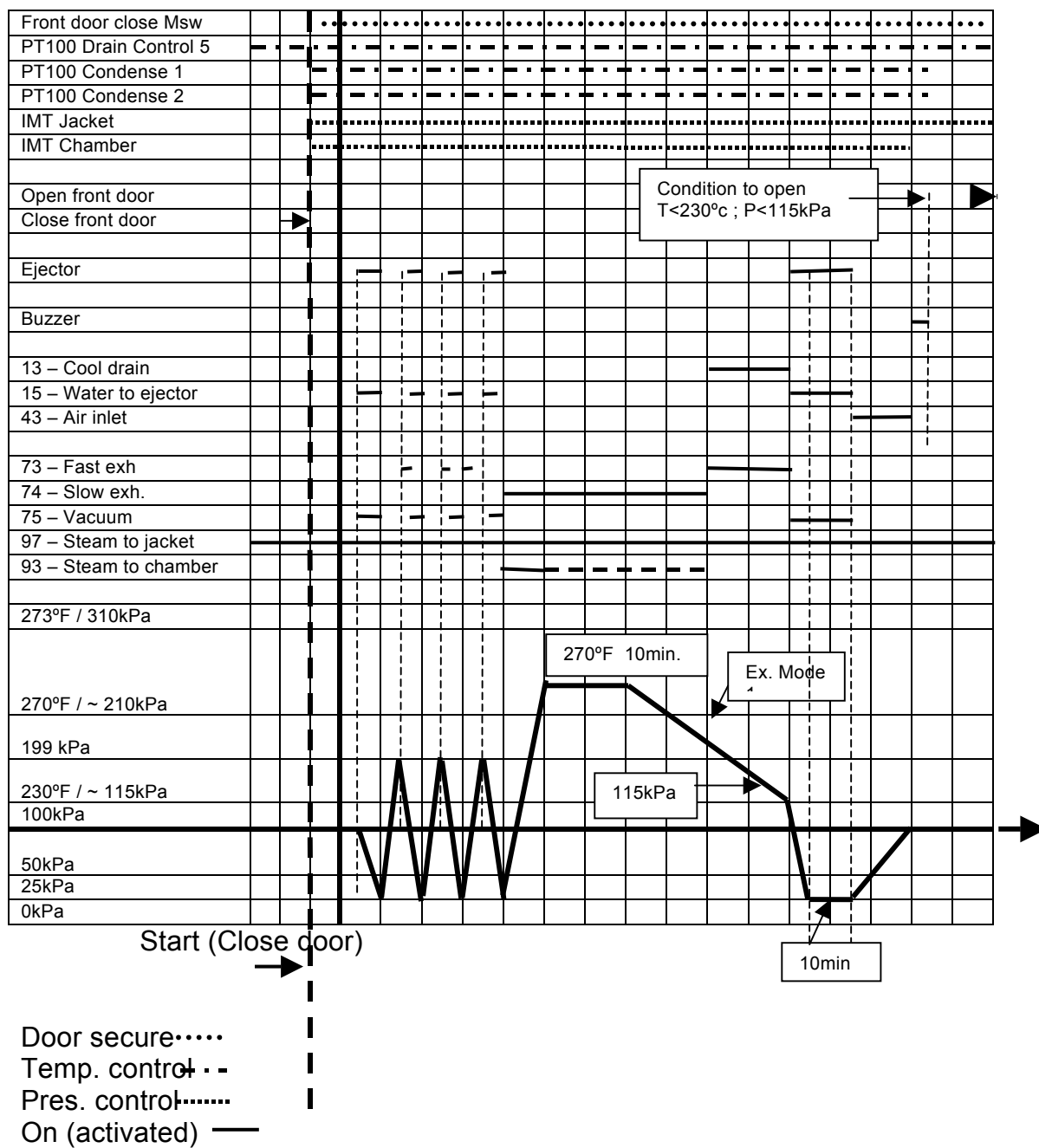
Drying is achieved by evacuating the vapor from the chamber in "under-pressure" phase along a period of 15 minutes.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 6- Wrapped goods - with Dry (270)



Program 7- for Wrapped materials (with Dry 274)

This program is intended for wrapped materials (like instruments), porous load and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 274°F
- ◆ Sterilization time: 7 mins.
- ◆ Drying period of 15 mins.

Performance description:

Residual air is displaced due to 4 vacuum pulses (down to 25 kPa) and 3 steam pulses up to 199 kPa. The 4th vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa .

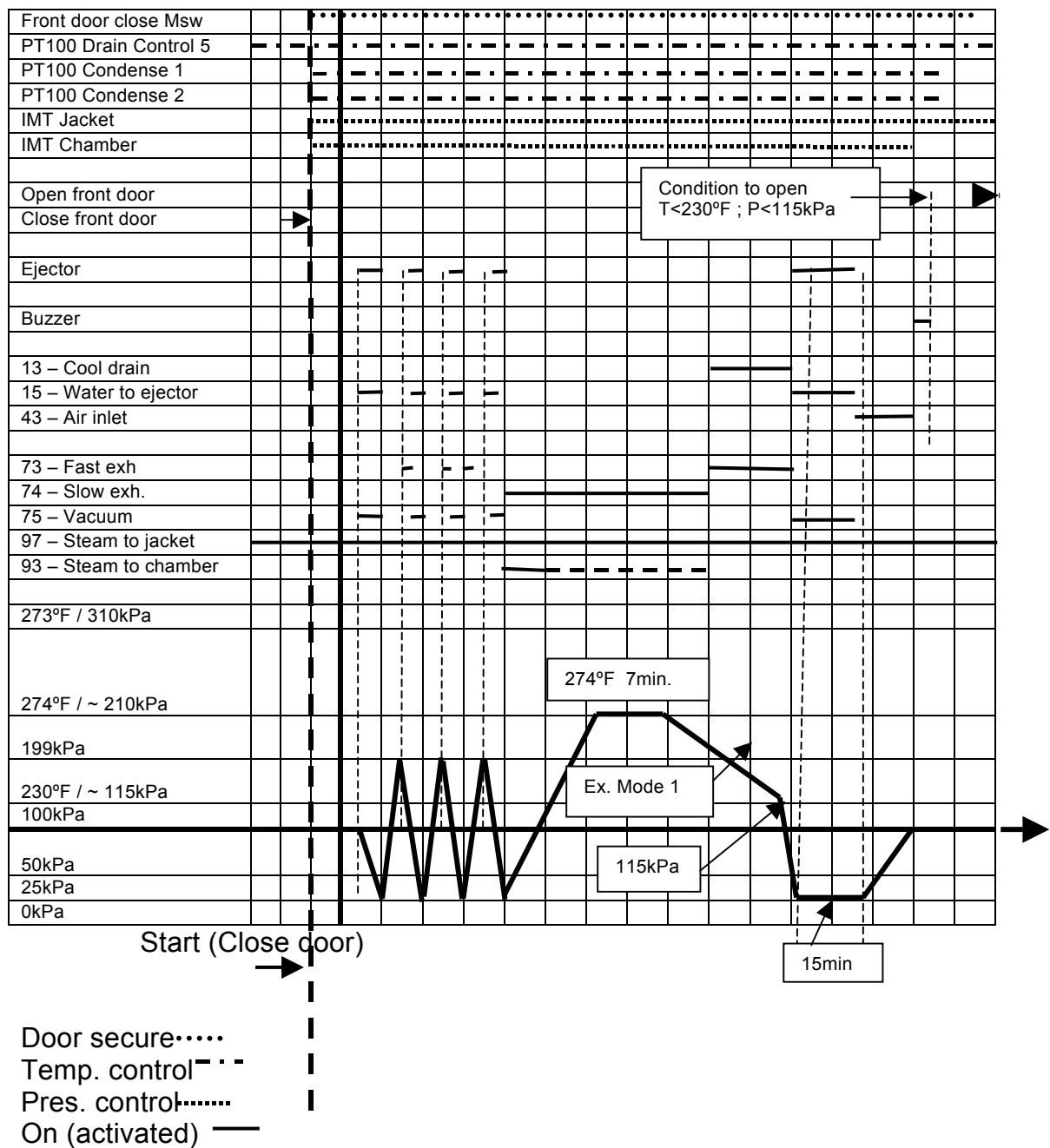
Drying is achieved by evacuating the vapor from the chamber in "under-pressure" phase along a period of 15 minutes.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 7- Wrapped goods - with Dry (274)



Program 8 (with Dry 270)

This program is intended for wrapped materials (like instruments), porous load and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 270°F
- ◆ Sterilization time: 3 mins.
- ◆ Dry time: 10 mins.

Performance description:

Residual air is displaced due to 4 vacuum pulses (down to 25 kPa) and 3 steam pulses up to 199 kPa. The 4th vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa .

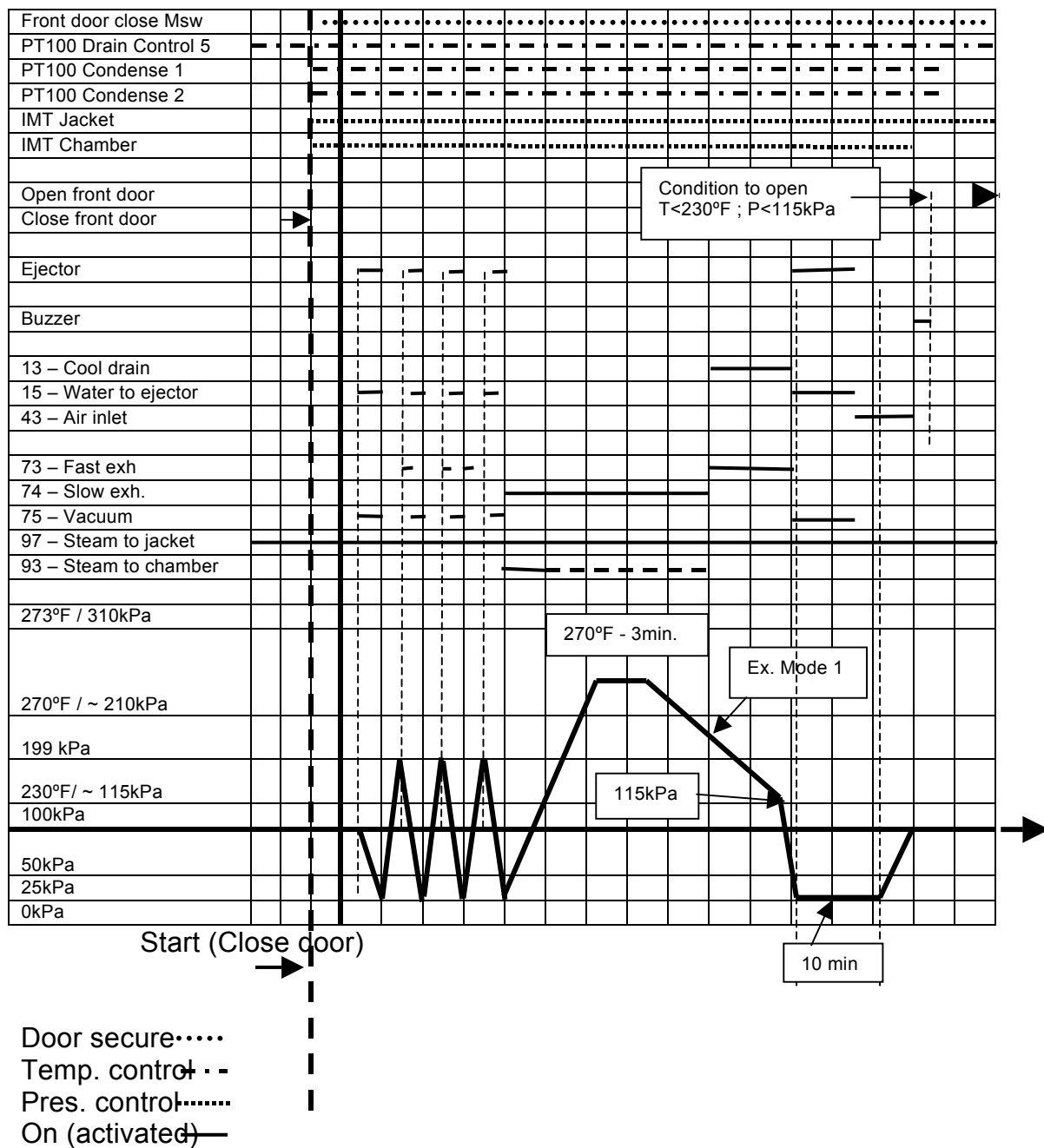
Drying is achieved by evacuating the vapor from the chamber in "under-pressure" phase along a period of 15 minutes.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 8- Wrapped goods - with Dry (270)



Program 9 - for Liquids (Slow 250)

This program is intended for the sterilization of liquids in open or closed containers (but not sealed) and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 250°F
- ◆ Sterilization time: 15 mins.
- ◆ Slow discharge of the pressure.

Performance description:

Residual air is displaced due to 3 vacuum pulses (down to 25 kPa) and 2 steam pulses up to 199 kPa. The 3rd vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

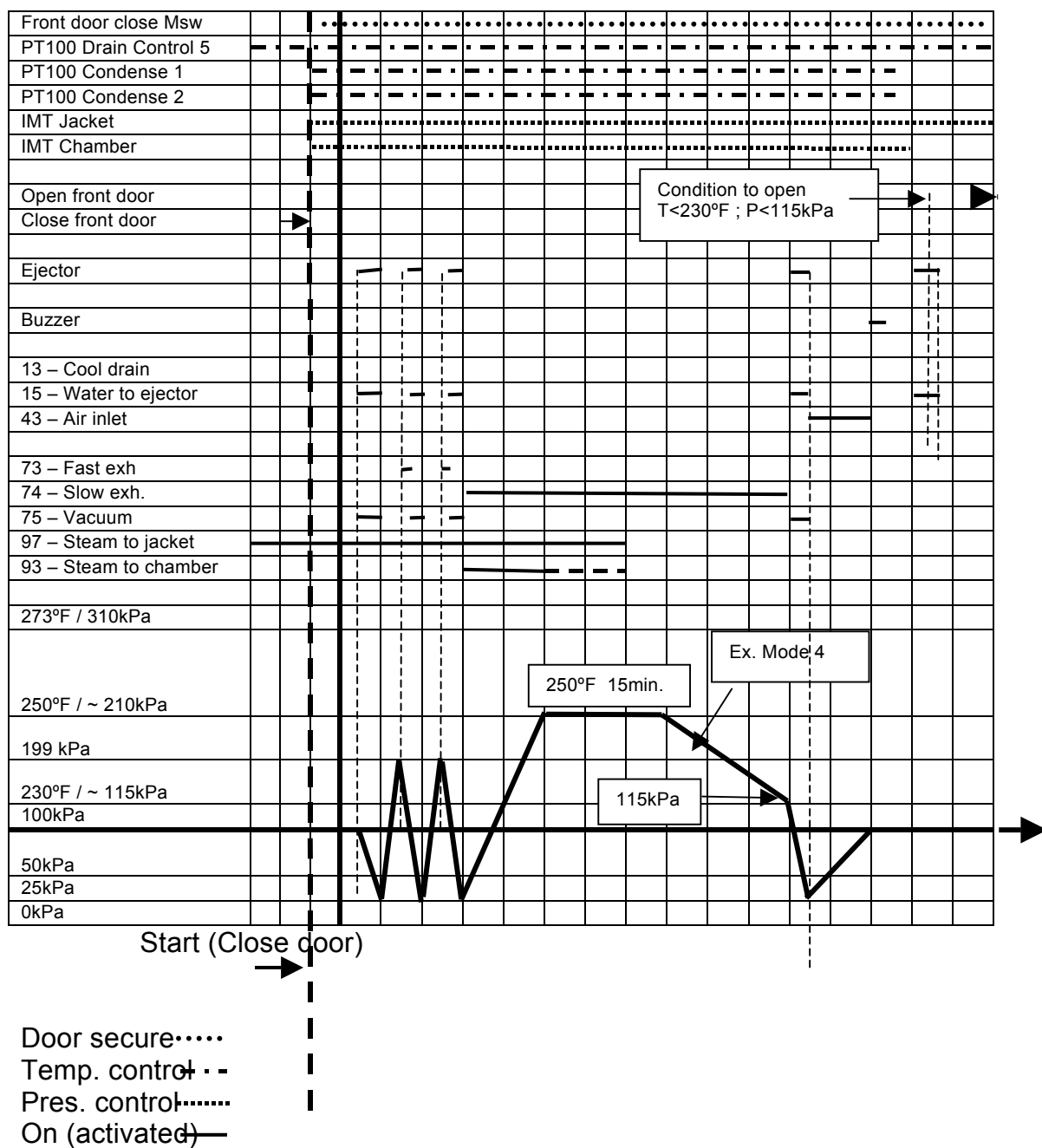
Slow exhaust stage is performed by discharging the pressure very slowly from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 203°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 9- Slow 250



Program 10 - for Liquids (Slow 250)

This program is intended for the sterilization of liquids in open or closed containers (but not sealed) and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 250°F
- ◆ Sterilization time: 15 mins.
- ◆ Slow discharge of the pressure.

Performance description:

Residual air is displaced due to 3 vacuum pulses (down to 25 kPa) and 2 steam pulses up to 199 kPa . The 3rd vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

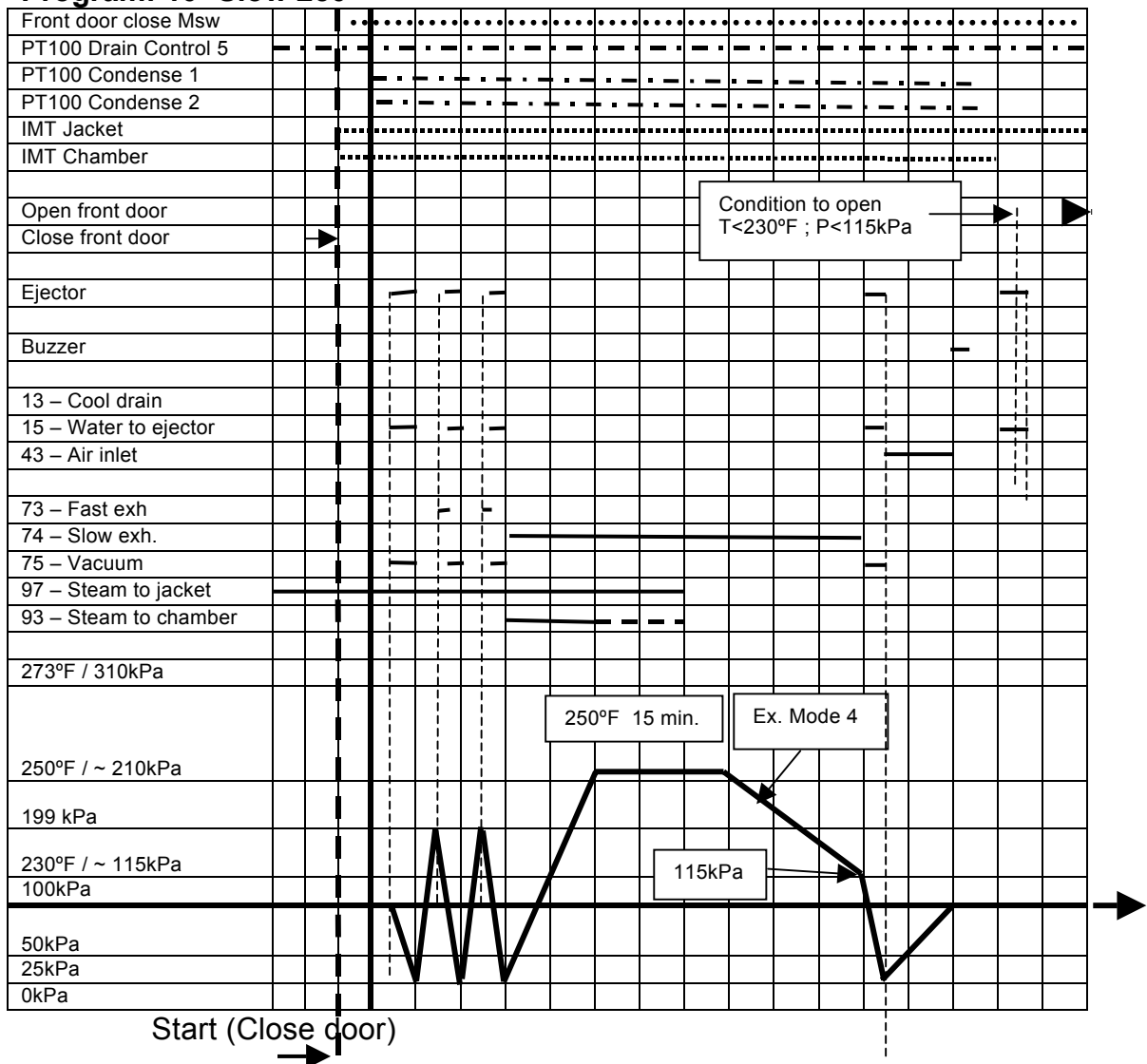
Slow exhaust stage is performed by discharging the pressure very slowly from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa .

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 203°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 10- Slow 250



Door secure.....
 Temp. control - -
 Pres. control.....
 On (activated)
 o

Program 11 & 12 - for Liquids (Slow 250)

This program is intended for the sterilization of liquids in open or closed containers (but not sealed) and other goods, which its manufacturer declares their compliance to be sterilized in the following conditions:

- ◆ Sterilization temperature 250°F
- ◆ Sterilization time: 15 mins.

Performance description:

Residual air is displaced due to 3 vacuum pulses (down to 25 kPa) and 2 steam pulses up to 199 kPa. The 3rd vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4°F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1 kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

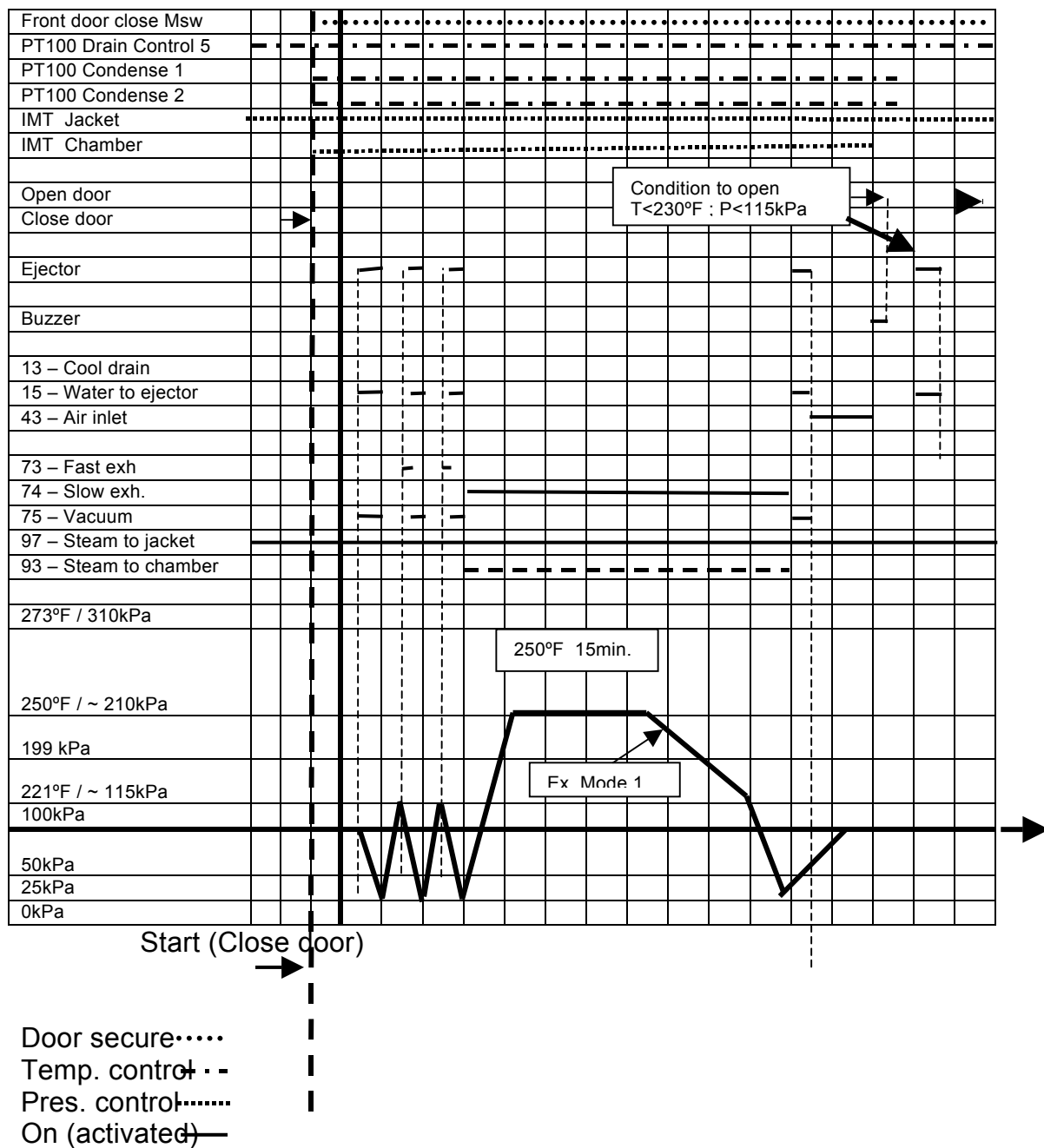
Slow exhaust stage is performed by discharging the pressure slowly from the chamber. When the pressure reaches a level of 115 kPa the ejector is activated till a pressure drop to 25 kPa.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 203°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 11 & 12 - Slow 250



Program 13 "Bowie & Dick Test"

This program is intended to test residual air in the chamber. The parameters are locked in such a way that they can not be changed. These are the parameters:

- ◆ Sterilization temperature 274°F
- ◆ Sterilization time 3.5 mins.
- ◆ Drying period of 2 mins.

Performance description:

Residual air is displaced due to 4 vacuum pulses (down to 25 kPa) and 3 steam pulses up to 199 kPa . The 4th vacuum pulse is followed with introducing saturated (controlled) steam into the chamber to the required sterilization temperature.

Sterilization period is controlled in such a way that the sterilization temperature will not drop below the required temperature, neither will increase by more than 37.4 °F. The saturated steam conditions are controlled in such a way that the fluctuation of pressure does not allow a drop below 1 kPa, neither an increase of 3 kPa above the high limit of the Ste. Temperature.

Fast exhaust stage is performed by discharging rapidly the pressure from the chamber. When the pressure reaches a level of 115 kPa the vacuum pump is activated till a pressure drop to 25 kPa.

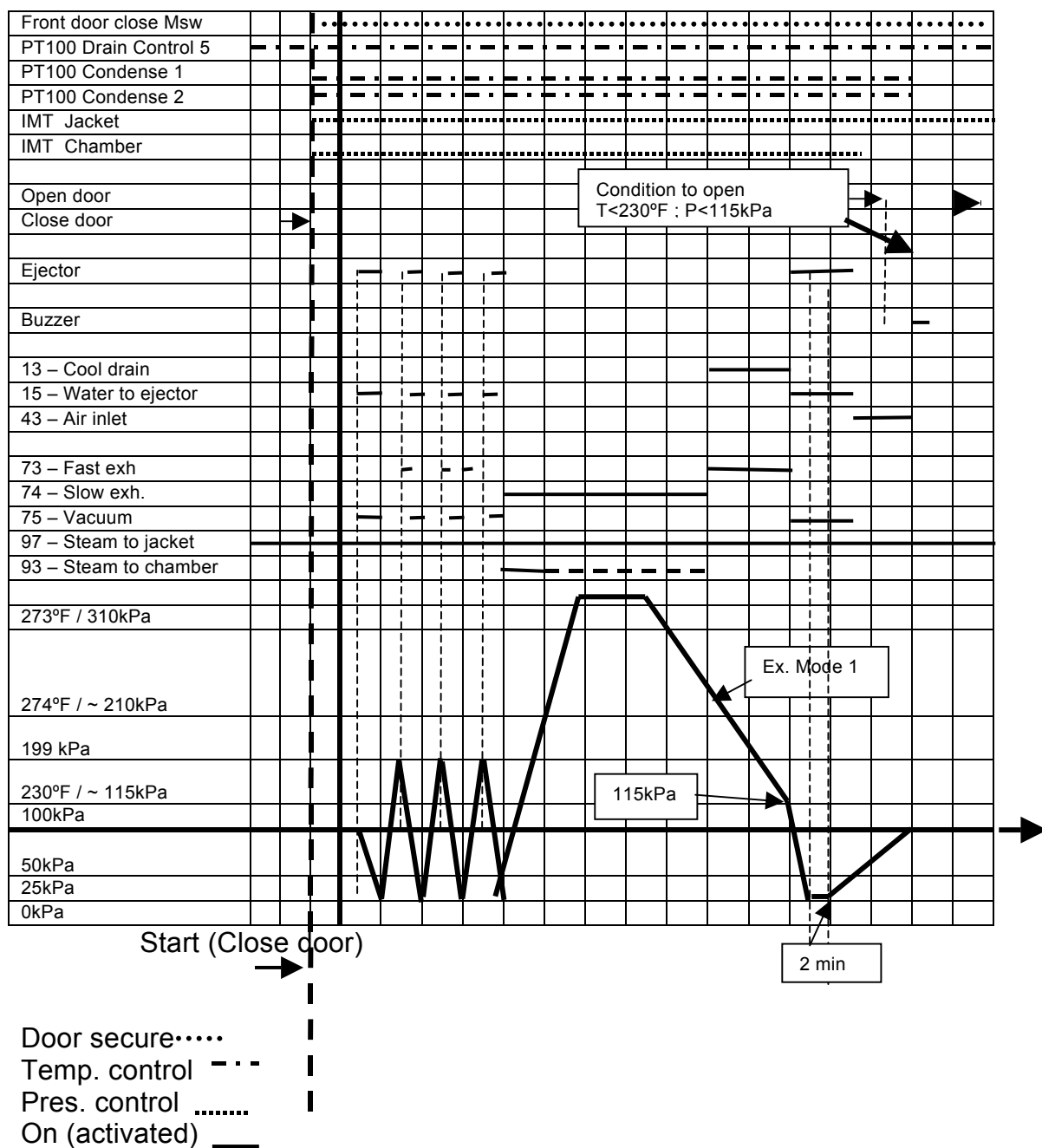
Drying is achieved by evacuating the vapor from the chamber in "under-pressure" phase along a period of 5 minutes.

Pressure equilibration. To enable the door to be opened, air is introduced to the chamber through a microbiological filter till the equilibration with atmospheric pressure.

Note:

The temperature of the chamber must be below 230°F and the pressure must be below 115 kPa to enable the door to be opened.

Program: 13- Bowie & Dick



Program 14 "Air leakage Test"

This program is intended to test air leakage to chamber through the door seal or any other seals.

This test is performed in vacuum phase.

Performance description:

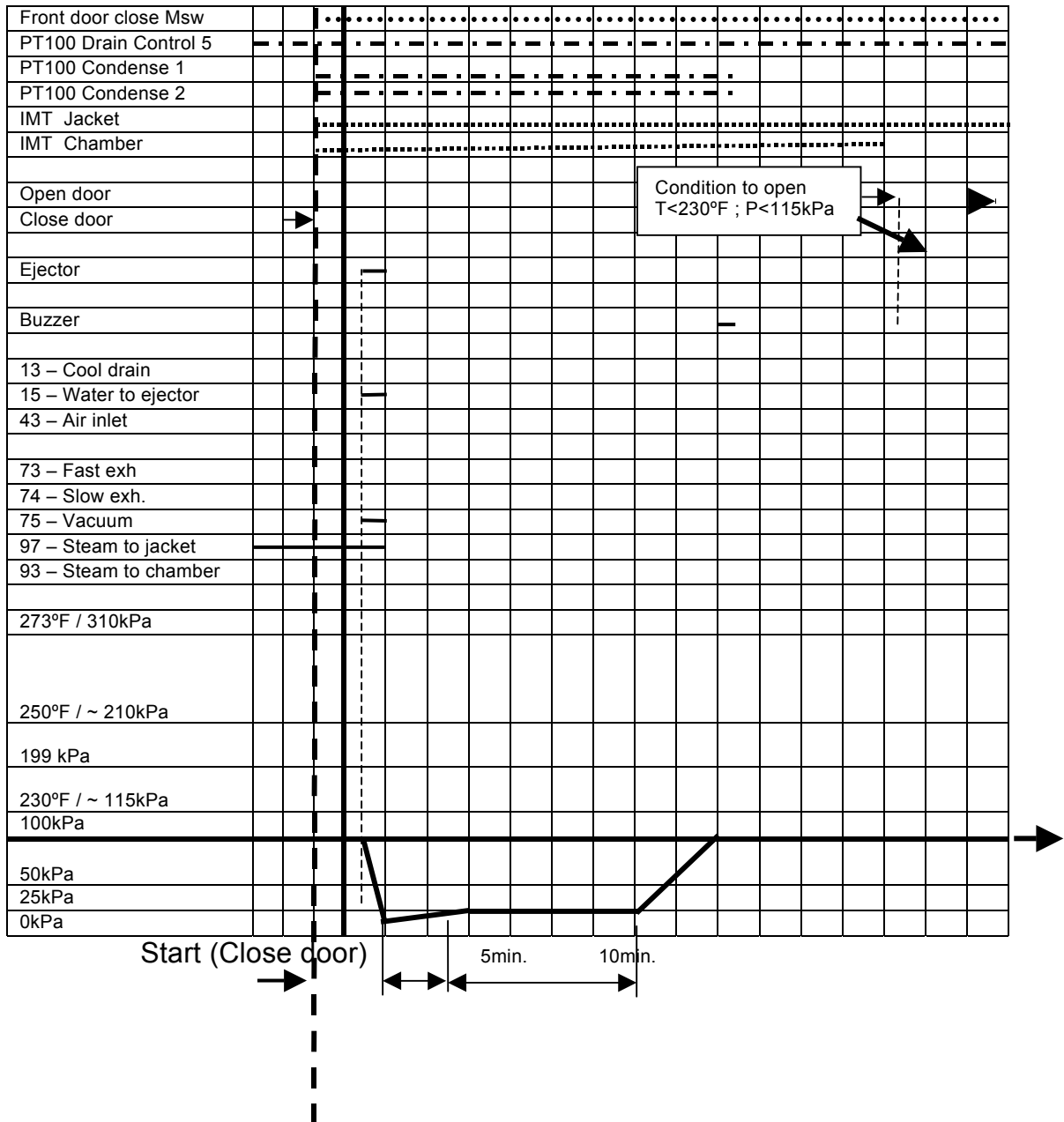
Vacuum is built up in the chamber down to 10kPa. At this stage all valves and motors are shut.

A period of 5 minutes is counted to enable stabilization of pressure.

During the next 10 minutes the pressure is monitored.

The allowable change of pressure during these 10 minutes is 1.3kPa.

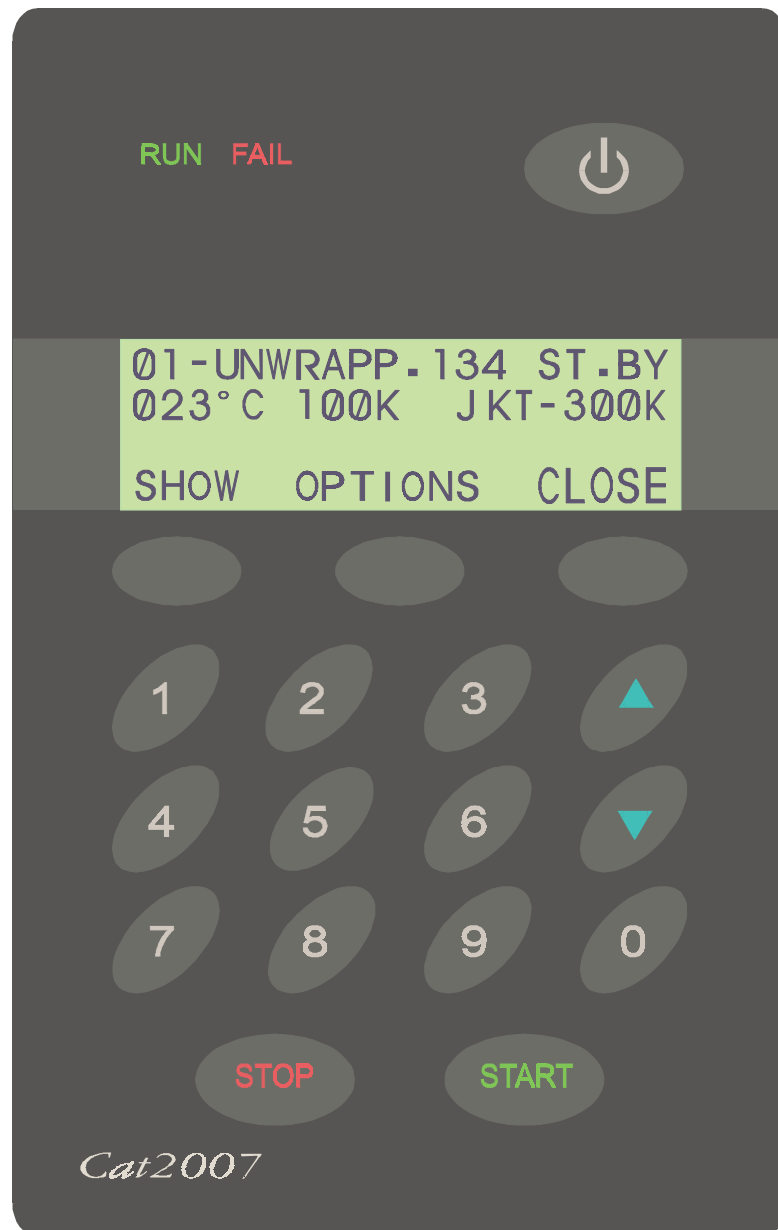
Program: 14- Air leakage test



Door secure.....
 Temp. control - -
 Pres. control
 On (activated) —

4. CONTROL AND MONITORING

Control Panel 'CAT 2007'



4.1 Description of panel 'CAT 2007'

The Operation Panel is composed of the following parts:

- ◆ 4 rows display, 20 characters in each row.
- ◆ 18 key pads
- ◆ 2 LED's (Fail, Run)
- ◆ 1 locking key

4.1.1 Keypad

STANDBY



The ON/ST.BY key is located on the top right side of the panel. Pressing the keypad lights up the operation panel. When there are 2 panels, both light up even though only one was pushed.

The 3 Command Keypads
F1-3: Functions 1-3



F1



F2



F3

These keypads are found under the display. The function to be performed will be listed on the display above the keypad.

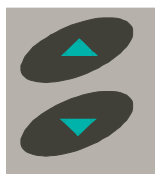
10 Digit keypads

These keypads are used for 2 purposes.

In normal working conditions, the program option is used – pressing on the number keypad, for example no. 3 selects program 3.

Under display mode, the keypads will be used as number keypads to enter a code or a number.

UP/DN Keypads



In normal working conditions they are used to browse through the different cycles.

Under set-up mode they will change numeric values or cause the display to progress to the next screen.

START Keypad



When the autoclave is in Ready position, pressing on START key activates the cycle.

STOP



This key is active whilst the autoclave is in process. Pressing this key at any stage of the cycle stops operation.

Canceling the FAIL message

At the end of an aborted process the FAIL light is turned on and an error message is displayed on the screen indicating the cause of the failure.

Pressing the STOP key cancels the displayed message and switches off the FAIL light.

RUN/FAIL LED's



The operation panel contains 2 small LED's are located on the top left corner. The RUN LED (green) lights when the autoclave is in process. When the system has been turned off at the ST.BY keypad, the RUN LED flashes for 1/2 a second for every 2 seconds showing there is still power entering the system (i.e. the appliance has not been switched off).

The FAIL LED (red) lights when there is a problem with the system.

4.1.2 Display

The CAT2007 display consists of 4 alphanumeric rows with 20 characters in each row:

First Row

First 3 characters define the Cycle no. (ranges from 1-14)

There are 8 characters to define the Cycle name.

The final 5 characters at the right of the row are allocated to displaying the status of the appliance or the stage in which the cycle is found whilst running.

- ◆ When the autoclave is in waiting stage – ST.BY
- ◆ When the autoclave is ready to work – READY
- ◆ When a process ends correctly – END
- ◆ When a program ends incorrectly – FAIL

The names of the stages follow:

- ◆ Vacuum
- ◆ Exh. (Exhaust)
- ◆ Heat
- ◆ Dry
- ◆ Ster. (sterilization)
- ◆ Test

Following are the 14 cycles, names and relevant temperatures:

Cycle no.	Program	Temp. °F
01-	Unwrapped	250
02-	Unwrapped	250
03 & 4	Unwrapped	270/274
05-	Wrapped	270
06-	Wrapped	270
07-	Wrapped	274
08-	Wrapped	270
09-	Liquids	250
09-	Liquids	250
10-	Liquids	250
11 & 12-	Liquids	250
13	B&D test	
14-	Leak test	

Second Row:

This row displays the temperature in the chamber, pressure in the chamber, and jacket pressure.

Third Row:

This row is used to display messages to the operator such as DOOR1 OPEN.

```
01-UNWRAPPE134 ST.BY
019.0°C 074K J072K
DOOR1 OPEN
SHOW OPTIONS OPEN
```


Fourth Row:

In the bottom row the names of the commanding keypads appear.

Under the display there are three keypads without symbols or names

These keypads receive their commands by the name that appears above them in the 4th row of the display. During a cycle, the fourth row is used to display the timers, such as STE Time 02:25, or during prevacuum, to display the stage of the pulse, such as puls1 – pump to 21K.

4.2 Description of Displayed Messages and Safety Measures

03 – Manual Stop	Message is displayed and the FAIL indicator lights after the STOP key is pressed for more than 1 second during the cycle (excluding the drying stage).
100 – Man.Stop	This message is displayed and the FAIL indicator lights after the STOP key is pressed for longer than one second in the drying stage.
05-Door Unlock	Message is displayed if either of the following occurs: The START button is pressed and the door is not closed; If during a cycle for eg. the pressure drops in the gasket.
06-Temp. Error	If the temperature sensor disconnects for any reason during the heating stage. Indications that there is a disconnection are if the read temperature is either higher than 140°C or lower than 5°C.
07- Low Heat	Message is displayed and sterilization does not start if the autoclave has not reached sterilization temperature after heating for the maximum time as defined in the HEAT T.O. parameter.
08- Low Temp.	Message is displayed, fail indicator lights and cycle is aborted, if the temperature drops for more than 5 secs. below the required sterilization temperature.
09- High Temp.	Message is displayed, fail indicator lights and program is aborted: If the temperature rises 37.4°F above the required sterilization temperature during the sterilization cycle.
10- Low Pres.	Message is displayed, fail indicator lights, and the program is aborted if the pressure drops for more than 5 secs. below the pressure correlated to the required sterilization pressure.
11-High Pres.	This message is displayed, fail indicator lights, and the program is aborted, if pressure rises above the pressure correlated to the sterilization temperature plus +37.4°F- for more than 5 secs.
12-Low Vacuum	This message is displayed if after 18 mins. the system has not reached VacDip1 or VacDip2 values during the prevacuum stage. It also appears if the Leak Test program fails.
13 – Jacket not Ready	This message is displayed if the START key was activated before the jacket reached the desired pressure.
21 – Door1 Safe Switch	If whilst opening door1 of an automatic sliding door the door1 switch closes, the door will open and this message will appear.
23 – Door1 Gasket Low Vacuum	If whilst opening Door1, you do not achieve the proper vacuum in Gasket1.

25 – Vac Res. Empty	If during the prevacuum stage, drying stage, vac. test or leak test it is revealed that the lower float switch in the vacuum water reservoir is open for more than 1 second (so there is no water entering the water reservoir and the pump has therefore been closed to protect it).i.e. Vfloat –L = “1”
27 – First Close Door	This message appears if there was an attempt to perform IN/OUT Test whilst the door was open.
190 – Water Too High	This message appears when the level of water in the chamber is too high. The chamber float switch detects the water level and in case it's too high closes all the valves and the FAIL indicator lights.

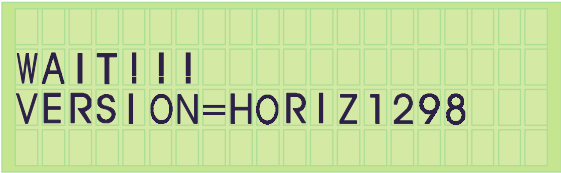
Informative Messages

Calibration	This message appears automatically on panel 2 during calibration.
Closing Door Wait	Whilst an automatic door is closing, this message is displayed in order that the operator will wait until the closing operation of the automatic door ends.
Open Door Wait	Whilst an automatic door is opening, this message is displayed in order that the operator will wait until the opening operation of the automatic door ends.
Door1 Open	This message appears when Door1 is open. It will also appear if the door is supposedly closed but there is not enough pressure in the gasket to seal it properly.
Under Test	This message appears on panel 2 during the IN/OUT Test and during SetUp.

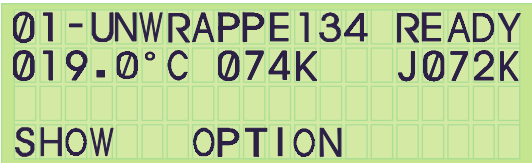
4.3 Operating the Control Panel

4.3.1 Starting up the System

After turning on the system, the following screen is displayed for a few seconds:

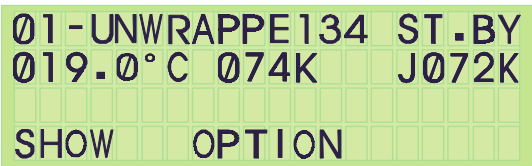


After a few seconds the **Stand By** screen is displayed.

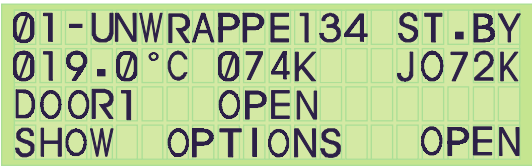


This is the central screen from which all operations can be performed. It is also the “**Ready**” screen from where cycles can be started when all the relevant conditions are fulfilled.

If the system is ready the display appears as follows:



If the system is not ready it will not allow you to start the cycle. If, for example, Door1 is open when the system is turned on, the display will warn the operator of this in the 3rd row of the display allocated to messages, and the screen will appear as follows:



The 3 command keys in the Stand By screen are:

Above the left keypad (F1)	Show
Above the middle keypad (F2)	Option
Above the right keypad (F3)	Open

4.3.2 Selecting a Cycle

A cycle can only be selected during Stand By from the Stand By / Ready screen which displays the cycle number and name in the top row.

A cycle can be selected as follows:

- ◆ Press the UP/DN keypad to change the cycle where pressing UP moves to the next program and pressing DOWN moves to the previous program.
- ◆ Press on a number. When pressing on keypad 4 the chosen program will be number 4, and so on.

04-WRAPPED	134	ST.BY
052.3°C	098K	J279K
SHOW	OPTION	



Selecting a 2 digit cycle:

When 2 numbers are pressed within 2 seconds of each other, then both the numbers define the program number (when the program number is 10 or above). For example; to chose program 12, number 1 must be pressed, and within 2 seconds number 2 must be pressed.

Show Parameters

After selecting the cycle, pressing the SHOW command key presents the following screen:

01-UNWRAPPE	134	ST.BY
077.6°C	097K	J335K
134°C	3min D-	1min
SHOW	OPTION	OPEN



where the message displayed in the 3rd row describes the following:

- ◆ the temperature; the sterilization temperature
- ◆ the time; the sterilization time
- ◆ D-Time; drying time.

This screen is displayed for 10 seconds after which it automatically returns to the ST.BY screen.

This command key is not active for cycle 14 – Leak Test.

Once the following conditions have been fulfilled,

- ◆ There is enough steam pressure in the jacket.
- ◆ Enough air pressure for the pneumatic valves (option).
- ◆ Doors closed.
- ◆ Enough water pressure for cooling (option).
- ◆ Enough water in the water reservoir.

the SETUP has been checked and the display is in the ST.BY /Ready mode, press START to run the cycle:

The RUN LED lights and the cycle is in progress.

After this, LED's switch off and the appliance is in Stand By or RUN program (depending on if the power turned off at the last time in order to run a program).

Power On Reset Test

1. Turn on the appliance
2. Be sure that all the valves and outputs, including LED's on the panel, are turned off.
3. Be sure the last illumination of the panels is turned on.
4. Be sure the message – Wait !!!
Version = (version name)
5. Appears on the 2 panels with the correct version.
7. Be sure that 2 LED's in each panel are turned off, the message deleted and the system passes to the Stand By stage.

In/Out Test – Design:

The system contains a stage called In/Out Test Stage. This includes all the required elements for the In/Out Test.

The test includes:

1. Testing all the outputs. Each time only one output is turned on. The output passes to 'ON' for a maximum time of 15 seconds or until the UP keypad is pressed.

The command begins from output number 1 until 24.

2. Testing of all the digital inputs should take a maximum time of 15 seconds for each input. When the input is found in "0" it will show 'ON' on the screen. When the input is in "1", it will show 'OFF' on the screen.

3. All the analog inputs will be displayed on the screen without a filter. As such it will be able to calibrate them at the time that the display is on the screen via the computer.

4. At the end of the stage, it will allow the In/Out Test to start afresh or to exit. When exit is chosen, the system will initialize from new.

5. Inputs for the In/Out Test require a code.

Testing the In/Out Routine

1. Turn on the system.

2. Press the OPTION keypad. The right command keypad will be called InOut.

By pressing on this key, the screen displays:

Code: Enter InOut Test

Code: Enter the code 2007.

The screen will display the message 'Digital 01 On!!!'. Be sure that OUT01 is on. Press on 'UP'. The screen will display the message 'Digital OUT02 on!!!'. Be sure that OUT02 is on.

4.3.3 System Set-Up (changing parameters and values)

Note:

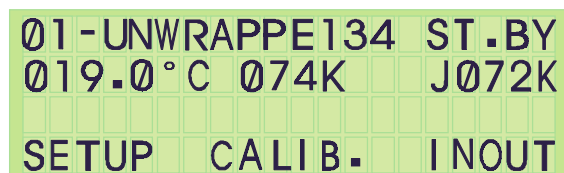
- ◆ The system allows 15 seconds for values to be entered. If this time passes and the panel has not been touched, the display will move on automatically to the next screen.
- ◆ When codes are not entered within the 15 seconds, the RUN and FAIL lamps light and the display return to WAIT and then the Stand BY screen.
- ◆ If the code is incorrect the above will also occur.
- ◆ When the display shows 0000 and a single value (i.e. between 1-9) is to be entered, the 0 must first be pressed. The single value can not be entered on its own, for example, to enter the number 4, the value is entered by pressing the 0 three times and then the number 4.
- ◆ When a value is to be entered, the right command keypad is Enter:
 - If the value is entered via the digit keypad, after the final digit is entered, the system automatically transfers to the next screen, and Enter need not be pressed.
 - If the value is entered using the UP/DN arrows, the Enter keypad must always be pressed to progress to the next screen.

The system setup includes the following functions:

Clock – Date and Time, Language, Doors Number, Door Type & Atmospheric Pressure

To check the system has been set up correctly, press the OPTION keypad in the ST.BY screen.

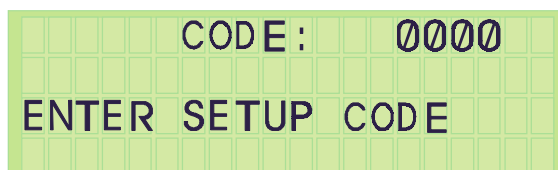
The screen displayed is as follows:



01-UNWRAPPE134 ST.BY
019.0°C 074K J072K
SETUP CALIB. INOUT



Press the SETUP keypad. The system requests a code.



CODE: 0000
ENTER SETUP CODE



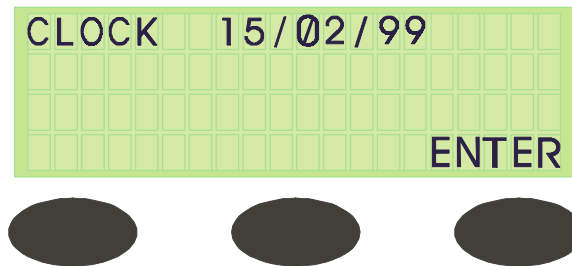
Enter the code and the display automatically moves on to the next screen after the last digit is entered.

Clock

The clock first displays the date and then the time.

Date

The date is always displayed as day/month/year.



Press the UP/DN keys to change the value.

1. Press ENTER (the right command keypad), after selecting the desired value to move on to the next value, i.e. the 'day value' will be underlined.
2. Press the UP/DN keypad to change the value and ENTER. The 'month value' will be underlined and the process continues.
3. To change the Year value to 00, keep pressing the DOWN key until you get to 0, press ENTER.

If no changes are to be made, then continue pressing ENTER to skip to the next step. After the year value, when ENTER is pressed the display changes to the Time display.

Time

Time is always displayed in hour/min/sec.

When entering the screen, the hour value is underlined.

Press the UP/DN key to change this value.

Press ENTER (the right command key), to move on to the 'minute value'.

Continue the process until the time is correct.

If no changes are to be made, press ENTER to move on to the 'minute value'.

Pressing ENTER after the second value has been changed automatically skips to the next screen – the Language screen.

If there were no changes to be made, continue pressing ENTER until the Language screen is displayed.

Language (Option)

4 popular languages have been specified with Latin letters only: English, German, French and Spanish.

This screen is only applicable if using different languages.

The right command key will be ENTER.

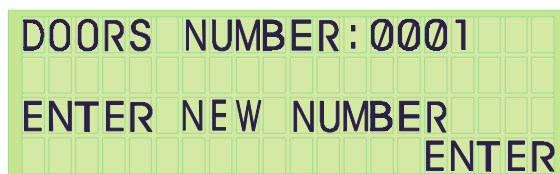
If English is being used, leave the code at 0 and press ENTER to move on to the next screen – Doors Number.

If the language requires changing, press the appropriate number from the choice below and then press ENTER.

English	0
German	1
French	2
Spanish	3

Doors Number

After entering the language, the display is as follows:



The options for this autoclave having one door, no key has to be selected. Press ENTER, and the system moves on to the next screen.

Door Type

There are 3 different door types for autoclaves – Manual Door, Hinged Automatic Door, or Sliding Automatic Door.

In this case the door is automatic, just press ENTER as this is the option already displayed (0001). Enter these values either through the UP/DN keys and then press ENTER, or physically enter the digits whereby the screen will automatically progress to the next display after entering the fourth digit.

Atmospheric Pressure

The atmospheric pressure at Sea Level is 100kPa. For every 100m above sea level, the atmospheric pressure drops 1kPa, and for every 100m below sea level, the atmospheric pressure increases 1kPa.

If pressure is set correctly, press ENTER and the next screen appears. If pressure needs to be altered, this may be done either through the digit keypad or the UP/DN keypads.

Jacket (Jacket Type)

If there is no Jacket, then press Enter.

If there is a Jacket, then via the UP/Dn keypads, choose the correct number according to the following conditions:

- ◆ 1-There is a Jacket – the steam to the chamber passes from the jacket
- ◆ 2-There is a Jacket – the steam to the chamber passes directly and not via the Jacket. Press 2 for this autoclave.
- ◆ 3-There is a Jacket and it is divided without a separation from the steam generator, and the steam passes via the jacket to the chamber.

F. O. Mode

This mode enables F.O. calculations, the processing being based on data fed by two temperature sensors one mounted in the chamber, one on the condensate pipeline.

The F.O. calculation is performed for cycles with Ster. Temp. in the range of 215°F - 273°F, especially used in Programs 9-12.

F.O. = 0 (unable),

F.O. 1= total heating time + total cycle time + cooling time.

F.O. 2 = compensates the difference between heating time, cooling time and exhaust. Calculates using factor 1.5 of the total accumulated heating and cooling time and converts that into the equivalent sterilization time.

Temp. F.O. = Determines the temp. at which F.O. calculations should begin.

4.3.4 Changing Cycle Parameters

The screen that allows for parametric changes appears as follows:

Pressing Clear or Enter before entering the code returns to the Stand By screen, and the RUN & FAIL LED's are lit.

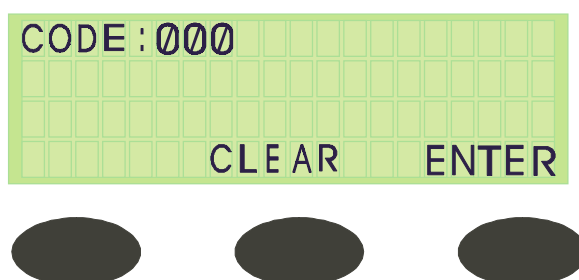
Enter the correct code only via the UP/DN keypads, press ENTER to proceed to the next screen.

Pressing the UP/DN keypads can also change all parameter values.

Cycle Setup Parameters:

Code 1 or 11 Parameters

STE Temp – Required sterilization temperature for the process



Entry code	1 or 11
Resolution	34°F
Minimum value	221°F
Maximum value	280°F

STE Time – Required sterilization time for the process

Entry code	1 or 11
Resolution	1 minute
Minimum value	Ø minutes
Maximum value	59 minutes

Dry Time – Required drying time for the process:

Entry code	1 or 11
Resolution	1 minute
Minimum value	Ø minutes
Maximum value	59 minutes

Heat T.O. – Maximum time for heating the chamber for starting sterilization

When the duration of the heating stage is longer than Heat T.O., the program will collapse with the message 'Low Heat'.

Entry code	11
Resolution	10 seconds
Minimum value	1200 seconds (20 minutes)
Maximum value	3600 seconds (minutes)

Ex Mode – The method for exhausting the steam at the end of the process

Ex Mode	
Fast Ex	1
N.A.	2
Slow Ex. (waste)	3
Slow Ex. (liquids)	4
Cooling with compressed air	5
Cooling with water circulation	6

EndTemp – Ending Temperature (Exhaust Stage)

Defines the temperature at which the process ends for opening the door.

Entry code	11
Resolution	34°F
Minimum value	104°F
Maximum value	279°F

PulsNum. – No. of pulses in the prevacuum stage

Entry code	11
Resolution	1
Minimum value	1
Maximum value	5

VacDip1 – Vacuum value in the first pulse

Defines the vacuum value in pulse no.1 of the prevacuum stage.

Entry code	11
Resolution	1 kPa
Minimum value	1 kPa
Maximum value	75 kPa

VacDip2 – Vacuum value in the remaining pulses

This value defines the vacuum in the remaining pulses in the prevacuum stage (not just pulse no. 2)

Entry code	11
Resolution	1kPa
Minimum value	1kPa
Maximum value	75kPa

VacTime1 – Waiting time in the first pulse

In the prevacuum stage, in the first pulse after reaching VacDip1, there is a waiting time known as VacTime1 (in seconds).

This delay occurs so vacuuming can continue.

Entry code	11
Resolution	1 second
Minimum value	3 seconds
Maximum value	1800 seconds (30 minutes)

VacTime2 – Waiting time for the remaining pulses

In the remaining pulses (not pulse no.1) in the prevacuum stage, after reaching VacDip2 stage there is a time delay known as VacTime2 (in seconds).

Entry code	11
Resolution	1 second
Minimum value	1 second
Maximum value	1800 seconds (30 minutes)

Wtr Time – Time for entering the water into the generator after the autoclave is touching the water

This value defines in seconds the time that the water pump continues working and entering water to the steam generator after the upper electrode touches water, to prevent a situation wherein immediately after the electrode touches water the pump immediately begins operation.

Entry code	11
Minimum value	Ø second
Maximum value	90 seconds

LimitP add – Adding pressure to the maximum pressure

This value defines addition to the maximum pressure that is computed to the jacket control.

For example: When the desired temperature is 273°F, the maximum temperature maintained in the jacket will be adjusted to a temperature of 137°C (i.e. 332kPa) When this pressure is not enough, it can be increased by changing the value of the LimitP add.

If the parameter value remains Ø, the maximum pressure in the jacket will be 332kPa, however if this value will be 10, the maximum pressure will be 342kPa.

Entry code	11
Resolution	1 kPa
Minimum value	ØkPa
Maximum value	30 kPa

Calib Code:

This parameter is used to set the calibration code.

Entry code	11
Resolution	1
Minimum value	0
Maximum value	255

Puls Pres1 – The pressure in pulse no.1 in the prevacuum stage

This defines the first pulse pressure in the prevacuum stage.

If it is defined as 100kPa, the system will not enter steam into the chamber, however the vacuum pump will immediately operate to create a vacuum.

If the value is defined over 100kPa, the system will open the steam valve to the chamber until the desired pressure is reached.

Entry code	11
Resolution	1kPa
Minimum value	100 kPa
Maximum value	200 kPa

Puls pres2 – The pressure in pulse 2 and onwards in the prevacuum stage

After the completion of pulse no.1, the system will enter steam by the defined value in puls press.

Entry code	11
Resolution	1 kPa
Minimum value	100 kPa
Maximum value	200 kPa

Stay Time - Waiting time between heating and sterilization

This parameter allows partial entry into the sterilization stage with a reduction of overshoot and the reduction difference between the different sensors that are entered into the chamber for control or validation.

In the heating stage the system stops heating before entering sterilization according to the STAY TIME value. When this value is 2 minutes, the system stops at 35.6°F before entering sterilization and will proceed at a rate of 33.80 °F/min during the STAY TIME.

Entry code	11
Resolution	1 min.
Minimum value	Ø min.
Maximum value	10 min.

This is the final parameter under Code 11. After pressing ENTER the display will return to the ST.BY screen

Dry Vac. - Dry Vac. =0 ; Vacuum pump works continuously.

Dry Vac. = 5; Vacuum pump works for 5 mins. after which air is introduced for 30 secs. of ON- and 30 secs. OFF intervals (depending on the interval selected by the operator).

Entry code	11
Resolution	1 min.
Minimum value	Ø
Maximum value	90

Code 13 Parameters:**ReqPrs+ - The addition to the required pressure for sterilization**

This parameter allows the pressure point that will be maintained during the sterilization stage to be set in the following manner:

If the desired temperature is 273°F, the required pressure (from the tables) is 305kPa.

When the ReqPrs+ is Ø, the system will be maintained at 305kpa during the sterilization stage. When the ReqPrs + equals 5kPa, the system will be maintained at 310kPa in the sterilization stage. It is advised to work with a value of 7kPa.

Entry code	13
Resolution	1 kPa
Minimum value	Ø
Maximum value	20 kPa

F.O. Temp Mode

Determines the temperature F.O. calculations will begin.

Entry code	13
Resolution	1
Minimum value	215
Maximum value	273

Select PT100

There are 3 sensors that regulate cycles – one for condense, one in the chamber, and one in drain control output.

Selections:

1. Sensor on the condense line x 2 (dual). (2)
2. Sensor in the chamber (1)
3. Sensor for drain control (5).

If sensor number 2 is not connected (faulty), the system will automatically work with sensor no.1 (the sensor in the condenser), even if 2 was selected, as 2 is only an option.

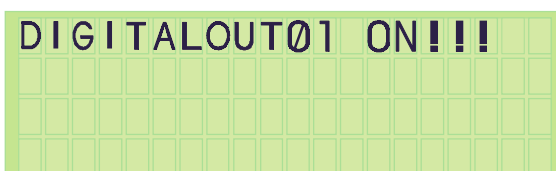
This is the final parameter under Code 13. Pressing ENTER; the display returns to the ST.BY screen.

4.3.5 Test Programs

To arrive at this option, return to the ST.BY screen and press the OPTION Keypad (the middle command keypad). Then screen will appear as with SETUP and Calibration. The word above the right command keypad will be INOUT. Press the right keypad you will be asked to enter a code.

Via the numeric keypad, enter the correct code. The display will automatically move on to the next screen after entering the final digit.

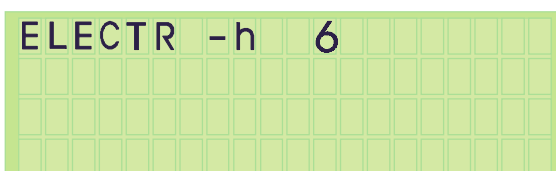
The screen will appear as follows:

A screenshot of a digital display showing the text "DIGITALOUT01 ON!!!". The text is in a purple, monospaced font. The background is a light green grid with 10 columns and 4 rows. The text is positioned in the top row, spanning the first 15 columns.

Every 15 seconds the Digital Out number will automatically increase by one until it reaches Digital Out21. It then automatically passes on to the next screen.

Pressing the UP keypad will also progress through the Digital Out values.

The next screen to appear is the following:

A screenshot of a digital display showing the text "ELECTR -h 6". The text is in a purple, monospaced font. The background is a light green grid with 10 columns and 4 rows. The text is positioned in the top row, spanning the first 15 columns.

The screen will display the message 'Electrd – h # #'. # # is a number value. When the electrode touches water the value will be small, from 80 down to 0 when the water is high in electric molecules. When the electrode is in the air (not touching water) the value will be higher than 80 up to 99.

This electrode is located in the generator so that if there is no water in the generator the value is said to be 99 (greater than 80). This electrode is the highest electrode in the generator.

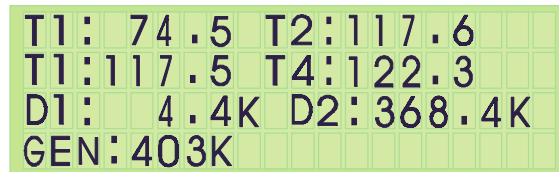
Press on 'UP' to move to the next stage, or wait 15 seconds and it will do so automatically.

The next screen to appear will display the message 'Electrd – L ##', with ## being a number value. When the electrode touches water the value will be small, from 80 down to 0 when the water is high in electric molecules. When the electrode is in the air (not touching water) the value will be higher than 80 up to 99.

This electrode is located in the generator so that if there is water in the generator the value is said to be 0 (lower than 80). This electrode is the lowest electrode in the generator.

Press on 'UP' to move to the next stage, or wait 15 seconds and it will do so automatically.

The next screen will appear as such



T1:	74.5	T2:	117.6		
T1:	117.5	T4:	122.3		
D1:	4.4K	D2:	368.4K		
GEN:	403K				

Where:

T1 – T4 display the temperature received from T1 until T4 (without a filter).

D1 – Displays the pressure in gasket 1

Gen – Displays the pressure in the generator.

In this stage you have to calibrate the displayed sensors.

Press on 'UP' to move to the next stage, or wait 15 seconds and it will do so automatically.

The next screen to appear refers to the digital inputs.

As with the digital outputs, it will progress to the next value automatically after 15 seconds, or by pressing the UP key. Values 5 & 7 – 11 will be OFF.

The final screen to appear in the INOUT test gives 2 options:

Pressing UP will return to the Code Entry screen for the INOUT Test.

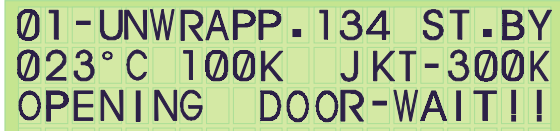
Pressing STOP will return the display to the ST.BY screen.

4.3.6 Display Function (applicable only for automatic doors)

Display when Open or Closing the Doors

Opening an Automatic Door

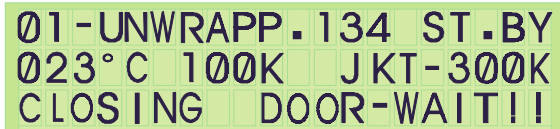
During the process of opening an automatic door, the message OPENING DOOR – WAIT will appear in the 3rd row.



01-UNWRAPP.134 ST.BY
023°C 100K JKT-300K
OPENING DOOR-WAIT!!

Closing an Automatic Door

During the process of closing an automatic door, the message CLOSING DOOR – WAIT will appear in the 3rd row.



01-UNWRAPP.134 ST.BY
023°C 100K JKT-300K
CLOSING DOOR-WAIT!!

If the pressure in the chamber is higher than 115 kPa, it will not be possible to open the door.

4.3.7 Display during a cycle

Display during the Pre-Vacuum stage

```
01-UNWRAPPE134 VACUM
076.5°C 081K J292K
PULS1-PUMP TO 25K
```

When the cycle passes to the Heat stage the steam enters the system, in place of 'PUMP TO 25K', it will display 'HEAT TO 160K'.

When the cycle then passes to the Exhaust stage, in place of 'HEAT TO 160K', it will display 'EXH TO 100K'.

Display during the heating stage

```
01-UNWRAPP.134 HEAT
125°C 270K JKT-300K
```

Display during the sterilization stage

```
04-UNWRAPPE134 STER.
134.5°C312K JKT-320K
STER TIME 02:25
```

Display during the Drying Stage

```
04-UNWRAPPE134 DRY
134.5°C312K JKT-320K
DRY TIME 15:25
```

Help:

If at any stage there is a problem, the system can be turned off at the power switch. Turn on the power again, whilst at the same time pressing the STOP keypad until you hear a long buzz. After the Loading screen, the screen lights with the message below.

The display returns to the ST.BY screen and you can continue from there.



5. CALIBRATION

The calibration of temperature and pressure is performed digitally.

The temperature and pressure measuring circuits, are designed with components having a 1% precision. The temperature circuit is linear and has an output of 100mV-2400mV for a temperature range 68°F-305°F.

The pressure circuit is also linear and has an output of 100mV-2400mV for a pressure range 0-400kPa.

The measuring at the A/D is void for values higher than 2400mV or lower than 100mV.

It is clear that even though the precision of the components of the circuit is 1%, the accumulated error can reach $\pm 5\%$, therefore calibration is necessary.

The system is provided, with non-erasable memory in which the offset and gain data of the sensors are stored.

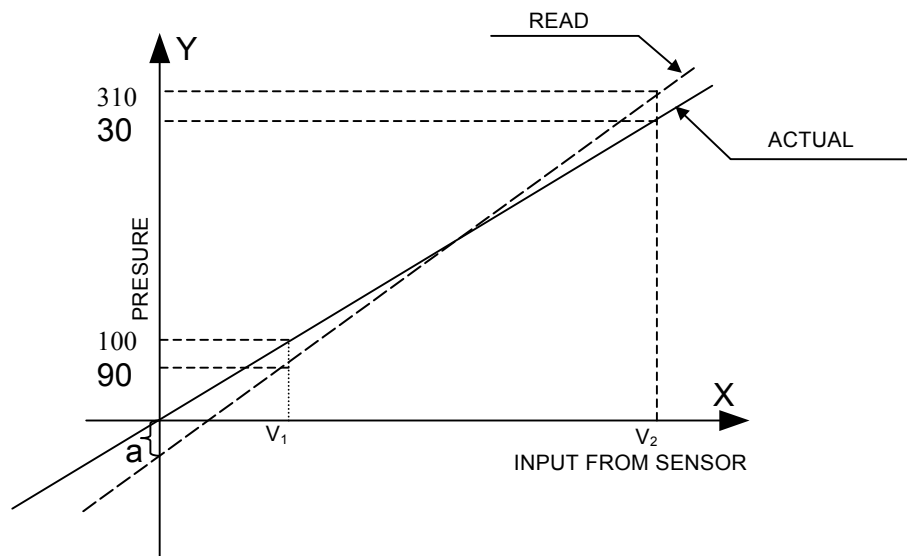
This data may be input to the system, through programming or through the autoclave.

In this chapter we shall describe the calibration of temperature and pressure through the autoclave, the programming calibration procedure is altogether identical.

Definition of Gain and Offset:

Every straight line can be defined by the equation $ax+b=y$. “a” is the deviation from $y=0$ and “b” is the slope of the line. In our case a =Gain and b =Offset.

The system is based on calculation of offset and gain of two points as in the following example. If the actual measured pressures are 100 kPa & 300 kPa and the displayed pressures are 90 kPa & 310 kPa respectively, the ‘input Vs pressure’ graph will be as follows.



The calibration method enables to introduce these data into the system in order to perform the automatic correction of the OFFSET and GAIN.

It is recommendable to find the two points which have to be input to the system, before performing the calibration.

5.1 CALIBRATING TEMPERATURE & PRESSURE

Return to the ST.BY screen and select the OPTION command keypad.
Above the middle command key the word CALIB is displayed. Press the middle keypad and the same screen for entering the SETUP code will appear.

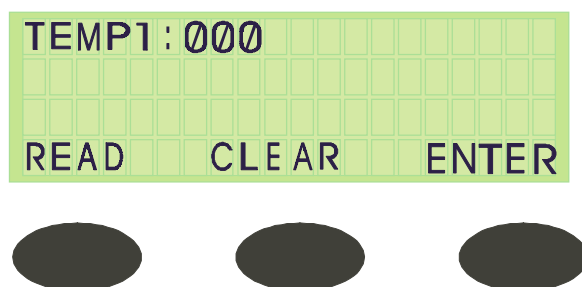
Enter the correct code via the digit keypad and the system begins displaying the calibration options.

Note:

- ◆ If the code is not entered within 15 seconds, the display returns to the Stand BY screen.
- ◆ If the code is incorrect it will return to the ST.BY screen
- ◆ In all screens following the code entry screen, the middle command keypad is Clear and the right keypad is Enter. Pressing on either of these keys takes you to the next screen.
- ◆ The values in all the following screens can only be changed via the UP/DN keypads. Once the correct value appears, press Enter and the system will progress to the next screen.

The screens appearing after the entry code screen for Calibration are as follows:

5.1.1 Temp 1:



Temperature of sensor 1 on the condense line.

This screen requests a code to be entered.

Press the UP key once, to enter the code value 001 and press ENTER.

This will provide the screen giving 4 temperature values:

A100	R100
A130	R130

Pressing the far right command key (F3) allows you to move to the different values, which may be changed using the UP/DN key only.

After F3 is pressed when it is on the last value, it will move to the next screen.

Pressing the middle command key (F2) will read the value of the sensor.

Pressing STOP will stop the cycle.

5.1.2 Temp 2:

Temperature of sensor 2 on the condense line.

Refer to Temp1 for instructions.

5.1.3 Temp 3 (Option):

Temperature of sensor 1.

Refer to Temp1 for instructions.

5.1.4 Temp 4 (Option):

Temperature of sensor 2.

Refer to Temp1 for instructions.

Temp 5 - For drain control output

Temperature of sensor 5.

Refer to Temp1 for instructions.

5.1.5 Chm Pres: (Chamber Pressure)

This screen requests a code to be entered.

Press the UP key once, to enter the value 001 and press ENTER.

This provides the screen giving 4 pressure values:

A100	R100
A300	R300

Pressing the far right command key (F3) allows you to pass to the different values, which may be changed using the UP/DN key only.

After F3 is pressed when it is on the last value, it moves on to the next screen.

Pressing the middle command key (F2) reads the value of the sensor.

Pressing STOP will stop the cycle.

5.1.6 Jkt Pres: (Jacket Pressure)

Jacket Pressure.

Refer to Chm Prs for instructions.

5.1.7 Gen Pres:

Generator Pressure.

Refer to Chm Prs for instructions.

5.1.8 D1 Pres:

Pressure in Gasket1.

Refer to Chm Prs for instructions.

After Enter is pressed, the Calibration options are concluded and the display returns to the ST.BY screen.

This calibration method enables the technician to change a certain point without affecting a second point.

E.g.: When we work at 273°F and at 250°F and during the temperature checking for 273°F, the thermocouple introduced in the chamber indicates the actual temperature 270°F; when we work at 250°F the thermocouple indicates the actual temperature in the chamber 250°F.

We are interested in correcting the measured temperature for 273°F without changing the temperature at 250°F which is accurate.

Considering the above example, setting data can be done as follows:

Upper Row	A 140° F	R 141°F
	A 266° F	R 266°F

The system calibrates the new offset and gain and loads them into the non-erasable memory.

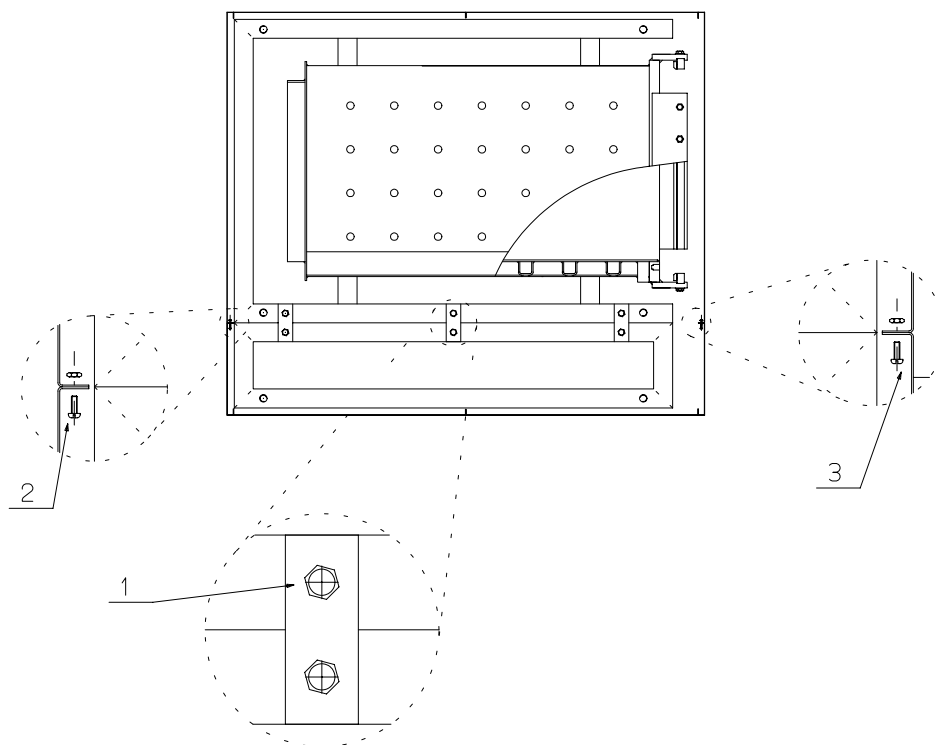
As a result, while running a 273°F program the correction is automatically done, while at 250°F no change is felt.

6. TRANSPORTATION OF THE AUTOCLAVE

To facilitate transporting the autoclave through narrow passageways, the cabinet is made in two sections. After transporting the autoclave to its destination reassemble.

1. Remove all the bolts which tighten the control panel with the autoclave panel (2,3).
2. Remove the bolts that tighten the control base to the autoclave base (1).
3. Disconnect the multi-pins connector mounted on the main electric box.
4. Separate the two autoclave parts.

After the autoclave has been installed at the desired location, connect the two parts according to the reverse order of the directions given for dismantling.



Top View

7. PREPARATION BEFORE STERILIZATION

Instruments to be sterilized must be clean, free from any residual matter, such as debris, blood, pads or any other material. Such substances may cause damage to the contents being sterilized and to the sterilizer.

1. Wash instruments immediately after use, to dispose of any residue.
2. Follow manufacturer's instructions on the use of products for cleaning and lubricating instruments after using the ultrasonic cleaner.
3. Before placing an instrument into the sterilizer tray, make sure that the instruments which are not of the same metal (stainless steel, carbon steel, etc.) are separated and placed in different trays.

Note: Check manufacturer's instructions for sterilization of each item.

4. In case of carbon steel instruments are used with stainless steel trays, the tray should be lined with a towel or paperwrap before placing the instrument. There should be no direct contact between the carbon steel and the stainless steel trays.
5. All instruments must be sterilized in an open position.
6. Place a sterilization indicator strip in each tray.
7. Once a week use a biological spore test indicator in any load to ensure sterilization.
8. Make sure that all the instruments remain apart during the sterilization cycle.
9. Empty canisters should be placed upside-down in order to prevent accumulation of water.
10. Do not overload sterilizer trays. Overloading will cause inadequate sterilization and drying.
11. Allow a distance of approximately 1" between trays to permit circulation of steam.
12. Wrapped instruments should be packed in material which promotes drying, such as autoclave bag, autoclave paper, muslin towels.

NOTE:

Verify that the packaging method is in accordance with Good Practice approach and the packaging materials are in accordance with the applicable standards (e.g. EN868 series).

The following is recommended:

Tubing

Rinse tubing after cleaning with pyrogen free water. When placing in tray, ensure that both ends are open, without sharp bends or twists.

Packs

Place packs upright on trays, side by side.

Packs should not touch the chamber walls.

Sterilization of Liquids

Use only heat-proof glass, filled 2/3 full.

Ensure that the glass container is covered but not sealed to prevent pressure build-up.

Loading

Every machine is supplied either with two stainless steel shelves, or with loading car and carriage.

The loading car is made of stainless steel and comes with adjustable shelves. It is designed to slide smoothly off the carriage into the sterilization chamber.

The carriage moves on four heavy - duty castors, which are mounted on its base.

When loading the materials to be sterilized into the chamber, observe the rules described in this chapter.

Do not overload the car or the trays as this can have adverse effects on the results of the sterilization and drying programmes.

Leave space between the packs or wrapped instruments to allow complete removal of air pockets in the conditioning stage, and for free circulation of steam in the heating and sterilization stages.

Unloading

On completion of the cycle, take out the load immediately from the sterilizer. Do not remove the load from the tray until its temperature reduces to the room temperature.

Let the load cool down in an area without air movement (air conditioning, etc.) and with minimum people passing by to avoid possibility of touching the hot load.

Do not touch the hot load since hot load absorbs moisture and, therefore, may absorb bacteria from your hand.

Do not transfer hot load to metal shelves for cooling. Perform a visual inspection to ascertain that sterilizing indicators have made the required colour change, and that the load is dry.

The load shall be rejected if:

- a. The package has been compressed.
- b. The package is torn.
- c. The load is suspected to be wet.
- d. The load fell on the floor.
- e. Condensed drops can be detected on the load.



During loading and unloading use safety gloves and glasses in accordance with local safety regulations and good practice.

8. INSTALLATION INSTRUCTIONS



Only qualified and authorized personnel are allowed to install, check, test, maintain and serve the autoclave.

Mounting

- ◆ Check after unpacking the autoclave that the Serial Number (S/N) on its nameplate corresponds with the package number.
- ◆ Place the autoclave on a level surface, leaving adequate space around it for operation and service requirements. (see also the drawings)
- ◆ The ambient temperature around the autoclave should not exceed 104°F, 80% humidity and the room must be ventilated 10 air changes/hour.



- ◆ Do not use the autoclave in presence of dangerous gases and vapors.

Utilities

Connect the autoclave to the utility supplies as follows:

Air

- ◆ Connect the air connector on the autoclave to the building air source by means of a 1/2" pipe at 90 to 120 psi (6 to 8bar)
- ◆ If there is no external air source, use a small, independent air compressor.

Mineral Free Water

- ◆ Connect the water reservoir container to a free mineral water supply source by a 1/4".

See also the Water Quality chapter!

Tap Water

- ◆ The autoclave should be supplied with tap water; its hardness should not exceed 0.7-2mmol/l. See also 2.5 Water Quality.
- ◆ The tap water pressure should be between 2 to 4 bar (30 to 60 psi).
- ◆ Connect the feed water to the network by a 1/2" pipe.

Drain

Connect the following outlets directly to a drain funnel. Or connect them through a drain collector pipe of 2" that should be covered. The drain system should be vented.

- ◆ The exhaust from the chamber by a 1" pipe.
- ◆ The drain-cooling by a 1/2" pipe.
- ◆ The condensate from jacket by a 3/4" pipe.
- ◆ The discharge from ejector by a 1" pipe.
- ◆ The steam generator drainage by a 3/4" pipe.

Power connection

- ◆ Connect the power cord, one phase, Neutral and Grounding to the terminals in the electrical box and the ground wire- GND to the grounding screw connection.
- ◆ The power outlet for the electrical supply is, 115 V/ 60 Hz.

Preliminary Checks

After installation and prior to putting the machine into operation, the following preparation and checks should be followed:

- ◆ Check the water and drain inlets are connected correctly to the utilities and the manual taps on the external lines and the autoclave piping, are open.
- ◆ Check the manual bypass screws (on the base of the pilot solenoid valves) are set in neutral position, i.e. the slit on the head of the screw is set in horizontal position.
- ◆ Search for leakage and fix piping joints if necessary.
- ◆ Check feed water pressure at the autoclave inlet complies with the requirements.
- ◆ Check the electrical network switchboard if the autoclave circuit is switched on, and fuses or circuit breakers are not interrupted, also checking if the correct voltage is present in the autoclave control box according to specifications.
- ◆ Check the circuit breakers in the control box are switched on.

If the results of the above checks are positive, the autoclave is ready for operation.

9. OPERATING INSTRUCTIONS

For identification of push buttons, LED's and valves refer to the next page:

1. Open the free-mineral water manual valve, to fill the water reservoir of the generator.
2. Open the feed water, manual valve for the vacuum pump supply and the drain cooling.
3. Open the manual valve of the compressed air inlet and set the air pressure at 6 bars.
4. Ensure the autoclave is powered by switching on the main switch located on the wall.
5. Watch the jacket pressure gauge, indicating the rising of steam pressure in the jacket. When the jacket pressure reaches 2.4 bars the sterilization cycle can be started.

Open the door by pressing the F3 function key located below the display, while the word OPEN appears on the lower row of the screen, above the F3 key indicating that the door can be open.

The message OPENING DOOR – WAIT is displayed in the third row. The door slides down to the lowest position.

Load the sterilizer, keeping in mind the recommendations of Chapter 7 in the operator's manual on 'Preparation before Sterilization'.

Note:

Selecting a program, setting the parameters and the operation modes can be done by the maintenance technician by setting the locking key in pos. OPEN and entering a code.

7. Close the door by pressing the F3 function key, when the word CLOSE appears in the lower row of the screen, above the F3 key. The door is lifted until being locked and the chamber is sealed. While the door is closing the message CLOSING DOOR – WAIT is displayed in the third row and the word READY appears in the first row, indicating autoclave is ready to start operation and the LED above the control panel is lit.
8. Select a sterilization program and press the START key, to operate the cycle. The entire sterilization process automatically proceeds. The LED RUN on the control panel is lit.
9. At the end of the cycle a buzzer sounds continuously, and the word END is displayed.

Open the door by pressing the F3 function key while OPEN is displayed above this key. Press the STOP key to cancel the alarm.

Note: In case of failed cycle or manual stop by operator, the two LED's RUN and FAIL are lit. The reason for failure is displayed on the screen.

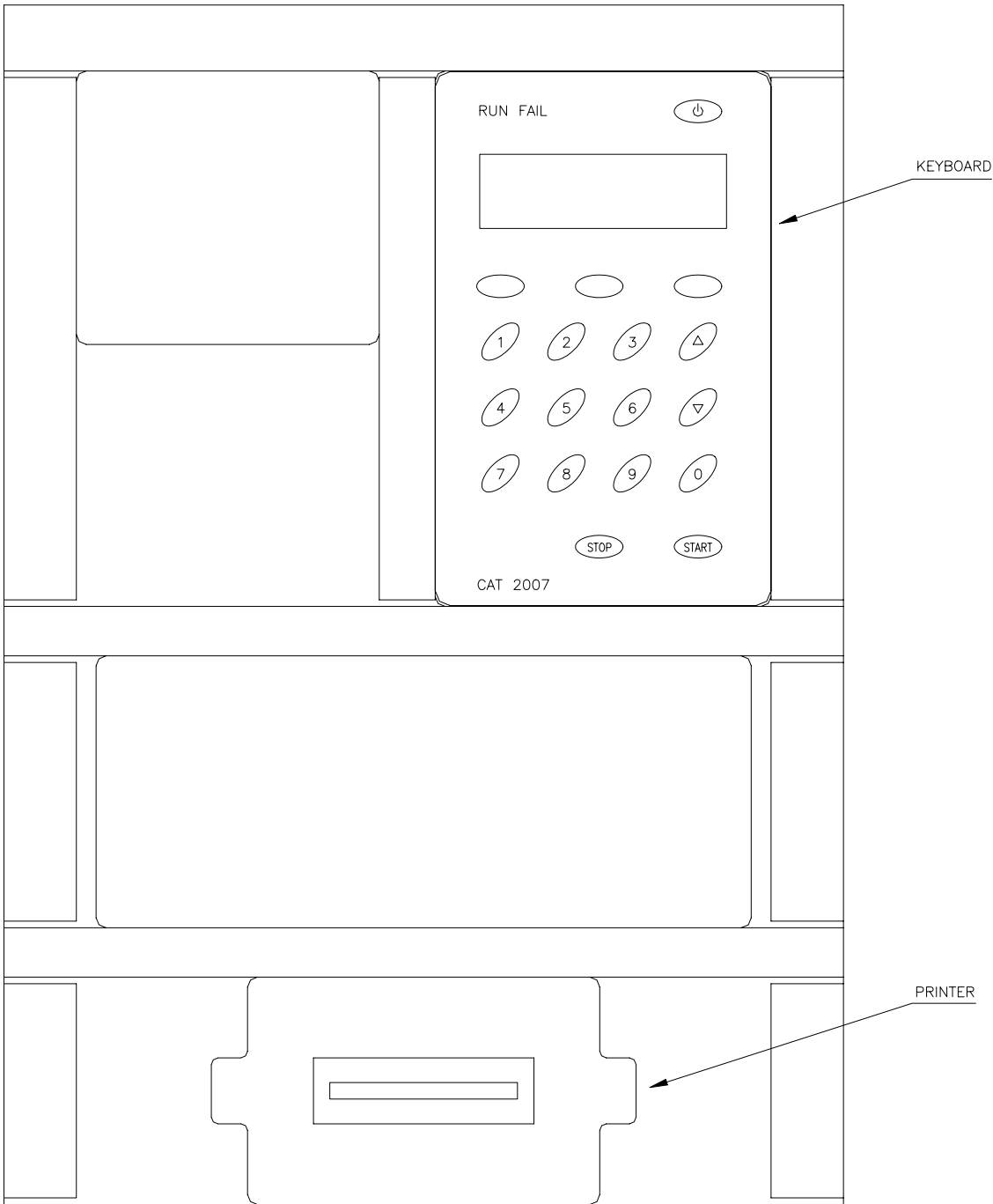
10. Take out the sterilized material from the chamber following the steps indicated in the 'Unloading' paragraph.



The sterility of instruments processed in unwrapped cycles cannot be maintained if exposed to non-sterile environment.

At the end of the day it is mandatory to close the feed-water and mineral-free water taps.

Control Panel Assembly



10. PRINTER

10.1 Printer Operation

The autoclave is equipped with a character printer, which prints a detailed history of each cycle performed by the instrument (for the record or for subsequent consideration).

The printing is made on thermal paper with 24 characters per line and contains the following information:

- ◆ Software version (is printed only on Power Dn)
- ◆ Real time
- ◆ Selected program
- ◆ Sterilization pressure
- ◆ Sterilization temperature
- ◆ Sterilization time
- ◆ Summary of performed cycle and identification hints.

When the sterilization cycle begins the printer starts printing the above data.

After the preliminary printing, the autoclave starts performing the sequence of operations of the cycle. The measured values of temperature and pressure are printed at fixed time intervals, according to the phase of the process, as shown in the table below.

The data is printed from the bottom up, beginning with the date and ending with "O.K." for a complete cycle or "FAIL" for an aborted cycle.

For an example of a typical printout, see next page.

PRINTER OUTPUT	DESCRIPTION
Autoclave: 2301006	Autoclave serial no.
Name : __-----	Name of the operator to be filled in .
Load #: 0030	Useful to determine when to clean the autoclave. To be filled in manually by the operator.
14/01/2003 13:45:16	Date and time the cycle ended
E13: 31 099.7°C 049.5k	The time, temperature and pressure during exhaust
F11:30 134.2°C 306.8k	If cycle fails, conditions at time of failure.
CYCLE FAILED! ! !	Message displayed if cycle fails.
Manual Stop - 03	If operator presses the manual stop button.
♦ S11:28 099.9°C 049.6k	The time, temperature and pressure during sterilization.
H10:08 134.3°C 315.1k	The time, temperature and pressure during the heating stage.
H06:04 132.3°C 304.1k	The time, temperature and pressure during the heating stage.
H02:00 116.2°C 217.3k	The time, temperature and pressure during the heating stage.
H03:00 080.6°C 023.1k	The time, temperature and pressure during the heating stage.
V00:27 078.3°C 048.7k	The time, temperature and pressure during air removal (vacuum).
Exhaust mode: 1	Exhaust mode: fast exhaust and process ends without pressure.
Dry time : 001 min	Drying time of the selected program
Ster time: 001.0 min.	Preset sterilization time of the selected program.
Ster Temp: 134°C	Sterilization temperature in chamber for selected program.
Cycle: 01 Unwrapp	Selected program: Unwrapped Instruments.
14/01/2003 13:29:31	Date/month/year time/mins./secs.
Version = HORIZ US3 eje	Number and version of the software program.

♦ S above is not part of this cycle and has been added on for an explanation of future reference to S - sterilization.

Legend

V - Vacuum stage
S - Sterilization stage
E - Exhaust stage
H - Heating stage
F - Fail

10.2 Printer Handling

The printer is driven and controlled automatically by the control unit, while the autoclave performs a sterilization program.

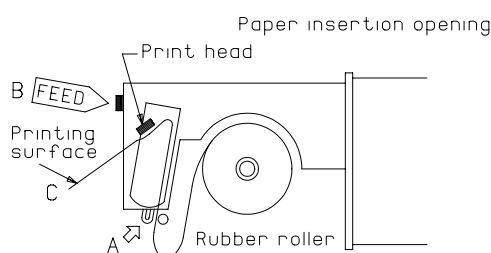
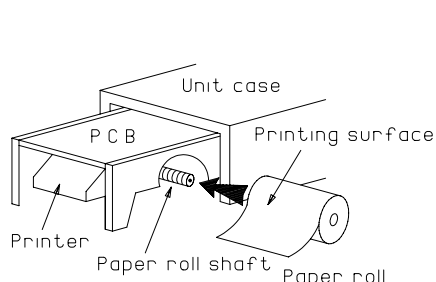


Figure 1

Figure 2

To set the paper roll in the printer perform the following steps:

- 10.2.1 Gently push the clips for removing the front panel, remove the panel and pull out the printer gently.
- 10.2.2 Set the paper roll on the shaft (See Figure 1). Since the outer and inner surfaces of the paper are different set the roll so that the printing surface is the outer.
- 10.2.3 Gently push the paper face down into insertion opening (A) in Figure 2. Keep pressing the feed switch (B) until the paper comes out from the print head (C).
- 10.2.4 When the paper emerges from the print head, insert it in the paper cutter (the slot in the front panel) and reassemble the front panel on the unit.

The paper roll is set inside the unit and the printer is ready for use.

NOTE: If the paper is not pulled in by the rollers even when you press the feed switch (B) push the paper in.

- 10.2.5 To ensure a reliable operation of the printer perform the following:
 - 10.2.5.1 Turn the main switch to the OFF position.
 - 10.2.5.2 Turn the main switch to the ON position; press the feed switch at the same time. Verify that the printer performs an operation test by printing all the built-in characters

The following precautions have to be taken ensuring the proper operation of the printer:

- ♦ Avoid contact between the paper and the hot parts of the autoclave, as the paper will be blackened.
- ♦ Do not pull out the paper roll from the paper insertion opening.
- ♦ Use only the 58mm. wide thermal paper rolls, supplied by your dealer.

11.MAINTENANCE OF AUTOCLAVE

11.1 Preventive and Periodical Maintenance

Before each cycle	User	<ol style="list-style-type: none"> 1. Clean the strainer at the bottom of the chamber. 2. Verify that the door gasket and the surface that the gasket is pressed on are clean.
Daily	User	<ol style="list-style-type: none"> 1. Before starting operation, ensure the compressor tank is drained of water (if applicable). 2. In case the autoclave is used to sterilize liquids, it is imperative to clean the chamber at the end of every day. Clean the chamber while the autoclave is cold.
Weekly	User	<ol style="list-style-type: none"> 1. Clean the cabinet and door parts, the internal walls of the autoclave, the shelves and the shelf rails with a soft cloth and detergent. Clean the chamber while the autoclave is cold. The detergent shall be flashed away. Caution Do not use steel wool or steel brush as this can damage the chamber! 2. Place several drops of oil on all the door spindles and pins. 3. Drain the generator as follows: <ol style="list-style-type: none"> a. Switch off the power. b. Wait until the pressure decreases to 0.5 bar (watch the pressure gauge). c. Open the drainage manual valve for a few seconds till the glass tube becomes empty, then close the valve. d. Drain the water level tube by opening the tube's valve located at the bottom elbow connecting the tube to the vessel. 4. Verify that the water quality complies with the requirements as detailed in par. 2.5 'Water quality'.
Monthly	Tech	<ol style="list-style-type: none"> 1. Allow the safety valve to blow off by letting the pressure increase until it reaches the working pressure + 10%. This verifies that the safety valve operates as required and the valve's seat is kept free of mineral deposits.
3 months	Tech	<ol style="list-style-type: none"> 1. Clean water strainers on pipelines while autoclave does not operate (idle). 2. Verify sewage pipe is not clogged ensuring free drainage of sewage liquids. It is important that sewage liquids do not overflow at the working site. 3. Disassemble the steam –traps and clean them. The cleaning operation requires cleaning of the filter inside the steam-trap. This can be done by rinsing and removing any dirt, which causes blockage. 4. Check the piping connections and tighten where necessary to avoid leakage. 5. Descale the generator (if applicable).
6 months	Tech	<ol style="list-style-type: none"> 1. Replace the 0.01μ air filter
Yearly	Tech	<ol style="list-style-type: none"> 1. Perform an overall check of the locking system and replace worn parts. 2. Check and tighten where necessary the electrical connections in the electrical board, connection box, motors, electrical valves, locking device screws and instrumentation. 3. Clean the electronic control unit, using a vacuum cleaner. 4. Check the door gasket and Replace if damaged. 5. Ensure periodical tests are done on time. 6. Check the steam-traps and replace if worn.

Notes:

1. Keeping the inside of the autoclave clean will lengthen its life and its proper operation.
2. Use only mineral-free water as detailed in par. 2.5 'Water quality'.
3. If you see or hear anything extraordinary, stop using the autoclave and call for service.

Periodical Tests

1. Once a year, calibrate and validate the autoclave.
2. Periodical safety tests referring to local rules, regulations or law shall be applied in compliance with the law.

SERVICE INSTRUCTIONS

11.2 Safety Tests after Repair



ATTENTION!

After every repair or dismantling the enclosure, the autoclave should pass two safety electrical test by the Service Engineer. The following shall be performed:

1. Enclosure Leakage Current Test.

Every autoclave should pass this test. The electrical potential of the testing instrument should be 500V and the test should be performed using the Megger. The insulation resistance should be at least 2 MΩ. The test is successful if there was no leakage.

2. Protective Earth Impedance Test

In the test should be measured the resistance between grounding screw on the rear plate (or any other metallic part) and the grounding pin of the power cord plug using the Ohmmeter. The resistance should not exceed 0.3 Ω.

After performing these tests, the Service Engineer should complete and sign the Work Order.

11.3 Troubleshooting

Symptoms		Possible causes check-ups and tests		Corrections
1. Control unit not energised. No displays and lights on the front panel.	1.1	The control circuit breaker switched off.	1.1	Check and switch on the circuit breaker.
2. STS generator does not operate.	2.1	Water pump defective or blocked.	2.1	Repair or replace pump. Replace motor.
	2.2	Blocking or low water pressure in the pump circuit.	2.2	Adjust water pressure, ensure a free circulation of water.
	2.3	Upper electrode short-circuited.	2.3	Clean or replace upper electrode.
	2.4	Pressure switch faulty or out of calibration.	2.4	Check, calibrate pressure switch or replace it.
	2.5	Lower electrode dirty or rusted.	2.5	Clean or replace the electrode.
	2.6	Contactors controlling the heat up current is damaged.	2.6	Check the cause and replace contactor.
	2.7	Control system trouble.	2.7	Replace boards.
	2.8	Solenoid or pneumatic steam supply valve stuck or defective.	2.8	Repair or replace solenoid or pneumatic valve.
	2.9	Vacuum in the water pump to STS generator.	2.9	Release the manual tap next to the water reservoir to release vacuum in the water pump to prevent air pockets.
Steam pressure goes beyond the control point.	2.10	Pressure switch faulty or incorrectly set.	2.10	Check, repair or replace the pressure switch.
3. Steam pressure goes beyond the control point.	3.1	Pressure transducer faulty or incorrectly set.	3.1	Check, repair or replace the pressure transducer.
	3.2	Contacts at contactor welded because of short circuit.	3.2	Check the cause, replace the damaged contactor.

Symptoms		Possible causes check-ups and tests		Corrections
4.The conditioning phase (prevacuum does not work).	4.1	Check if the trouble is due to pump or its electrical supply circuit.	4.1	See solutions indicated in par. 2.
	4.2	The vacuum valve passing water through the vacuum pump stuck or damaged.	4.2	Check, repair or replace the water to pump valve.
	4.3	The exhaust to pump valve stuck or damaged.	4.3	Check repair or replace the fast exhaust valve.
	4.4	Door improperly closed, gasket damaged or incorrectly seated on the groove.	4.4	Close the door, fix or replace the gasket.
	4.5	Leakage at the vacuum or exhaust piping.	4.5	Check and tighten fitting joints, replace defective packing.
	4.6	Steam inlet valve blocked or damaged.	4.6	Fix or replace the steam valve.
No steam inlet or low steam pressure.	4.7	Low pressure at the steam supply line.	4.7	Check the steam generator as shown in par. 2.
	4.8	Control system trouble.	4.8	Replace the control boards.
5. Prevacuum phase completed but temperature and pressure are low and the sterilization point is not reached or takes a long time to reach it.	5.1	Low pressure at the steam supply line.	5.1	Check steam generator, fix pressure.
	5.2	Steam inlet valve clogged or damaged.	5.2	Check and fix or replace the steam valve.
	5.3	Electronic pressure transducers or measuring circuits faulty or set too low.	5.3	Set correctly or replace boards.
	5.4	Control system trouble.	5.4	Replace the control boards.

Symptoms		Possible causes check-ups and tests	Corrections	
6. Temperature rises above the preset sterilization value.	6.1	Steam pressure too high.	6.1	Check and set correctly the pressure switch of the generator and the pressure reducer.
	6.2	Steam valve leaks.	6.2	Fix or replace the steam valve.
	6.3	Control system trouble.	6.3	Replace control boards.
7. Fast or slow exhaust phases do not function; chamber pressure remains high or exhaust takes too long.	7.1	The fast or slow exhaust valves stuck or damaged.	7.1	Repair or replace damaged valve.
	7.2	Steam valve leaks.	7.2	Repair or replace steam valve.
	7.3	Control system trouble.	7.3	Replace control boards.
8. Drying stage does not work.	8.1	Trouble with the vacuum system.	8.1	See par. 2 and 4.
	8.2	Steam valve leaks.	8.2	Repair or replace steam valve.
	8.3	Control system trouble.	8.3	Replace control boards.
9. The air inlet does not work.	9.1	Air inlet valve clogged or damaged.	9.1	Repair or replace air valve.
	9.2	Air filter clogged.	9.2	Replace air filter.
10. Unsatisfactory results of sterilization process.	10.1	Incomplete removal of air pockets.	10.1	See trouble related to vacuum system par. 2 and 4.
	10.2	Sterilization conditions improper temperature or pressure too low, ste. time too short.	10.2	Set correctly the temp. and time according to the sort and quantity of material.
	10.3	Incorrect loading of autoclave, air trapped in the load.	10.3	See par. on 'Preparation before Sterilization'.

Symptoms		Possible causes check-ups and tests	Corrections	
11. Drying incomplete packs remain wet.	11.1	Insufficient steam pressure to jacket.	11.1	Set or fix the pressure transducer.
	11.2	Insufficient vacuum.	11.2	See problems related to vacuum par. 2 and 4.
	11.3	Steam trap does not eliminate the condensate.	11.3	Clean or repair the steam trap.
	11.4	Incorrect loading of the autoclave.	11.4	Reload the autoclave appropriately.
12. Problems related to the control system.	12.1	Check if the flat cable or MOLEX connectors between the control boards and keyboard are well plugged in.	12.1	Plug in firmly the MOLEX connectors.
	12.2	Power supplies out of order.	12.2	Fix or replace the power supply.
	12.3	Control boards or keyboard.	12.3	Replace defective board of microcomputer unit.
	12.4	Paper to printer missing or quality unsuitable.	12.4	Insert a paper roll inside the printer. Ensure the appropriate type of paper is used.
	12.5	Flat cable connection between control board and printer is not plugged in correctly.	12.5	Plug in connection or replace it.
	12.6	Printer damaged.	12.6	Replace the printer.
	12.7	Temperature sensor disconnected or loose connection. Sensor damaged.	12.7	Fix connection or replace sensor.
	12.8	Pressure transducer, bad. Mechanical or electrical connections or transducer damaged.	12.8	Fix connection or replace transducer.

Symptoms		Possible causes check-ups and tests		Corrections
13. Door not closing.	13.1	Low pressure at the air supply line.	13.1	Set the air pressure.
	13.2	Solenoid valve transmitting air pressure to door cylinder for lifting the door is stuck or damaged.	13.2	Repair or replace the solenoid.
	13.3	Close Door button is defective.	13.3	Replace the button.
	13.4	Safety switch stuck or damaged.	13.4	Fix or replace the safety switch.
	13.5	Control system trouble.	13.5	Replace the control board.
14. Door locked but chamber is not sealed.	14.1	Low pressure at the air supply.	14.1	Set the air pressure.
	14.2	Low steam pressure at the door gasket.	14.2	Set the steam pressure.
	14.3	One of the two valves pressure or vacuum to gasket blocked or damaged.	14.3	Fix or replace the pneumatic valve.
	14.4	Solenoid valves pressure or vacuum to gasket, blocked or damaged.	14.4	Repair or replace the solenoid valve.
	14.5	Control system trouble.	14.5	Replace the control boards.
15. Door not opening.	15.1	Low pressure at the air supply line.	15.1	Set the correct air pressure.
	15.2	Insufficient vacuum to gasket, due to trouble with the vacuum system.	15.2	See par. 2.
	15.3	Gasket improperly seated or damaged.	15.3	Mount the gasket correctly, or replace it.
	15.4	Solenoid valves operating the two pneumatic valves, pressure to gasket or vacuum to gasket defective.	15.4	Repair or replace the damaged solenoid valve.
	15.5	The vacuum to gasket valve blocked or damaged.	15.5	Replace or repair the damaged valve.
	15.6	The solenoid valve which transmits air pressure to the door cylinder for lowering the door is stuck or damaged.	15.6	Replace or repair the valve.
	15.7	Control system trouble.	15.7	Replace control boards.

11.4 Troubleshooting for the Water Pump 'SHURFLO'

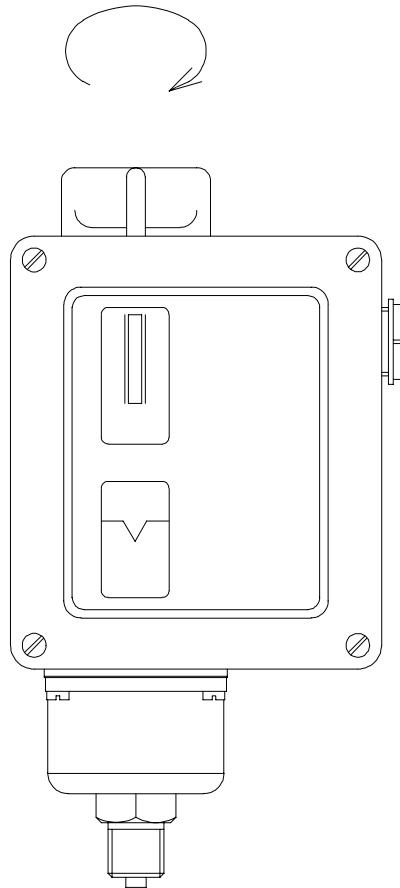
Symptom	Possible cause	Corrections
1. Pump does not start.	1.1 Fuse burnt or circuit breaker tripped. 1.2 Wrong voltage. 1.3 Damaged electrical connection. 1.4 Faulty pressure switch. 1.5 Open or grounded circuit due to faulty rectifier or motor. 1.6 Locked drive assembly.	1.1 Replace fuse or turn on the circuit breaker. 1.2 Use right voltage. 1.3 Fix connections. 1.4 Replace pump. 1.5 Replace pump. 1.6 Replace pump.
2. Pump does not prime (motor runs but water is not discharged).	2.1 No water supply. 2.2 Inlet water strainer clogged. 2.3 Vacuum leak in inlet line. 2.4 Inlet or outlet tube severely kinked. 2.5 Debris in pump inlet or outlet valves. 2.6 Pump operating on wrong voltage. 2.7 Pump housing damaged (cracks).	2.1 Fix water supply. 2.2 Clean inlet strainer. 2.3 Replace piping. 2.4 Straighten or replace tube. 2.5 Clean valves. 2.6 Use right voltage. 2.7 Replace pump.
3. Leak from pump head or switch.	3.1 Loose screws at switch or pump head. 3.2 Switch diaphragm ruptured or pinched	3.1 Fasten screws 3.2 Replace damaged pump.
4. Pump will not shut-off	4.1 Output line closed and no leaks. 4.2 Air trapped in outlet line or pump head. 4.3 Pump operating on wrong voltage. 4.4 Inlet or outlet valves clogged. 4.5 Loose drive assembly or pump head screw. 4.6 pressure switch operation/adjustment incorrect	4.1 Open outlet line. 4.2 Remove trapped air. 4.3 Use right voltage. 4.4 Clean clogged valves. 4.5 Fasten loose screws. 4.6 Refer to S/B #1031 for differential and pressure adjustment procedure.
5. Pump runs loudly	5.1 Loose pump head or drive screws.	5.1 Tighten loose screws.

11.5 Pressure Switch

Pressure Switch type RT 200:

This pressure switch regulates the steam pressure output of the generator. It is factory regulated, but in case this regulation is not accurate the following steps should be taken:

1. Turn pressure switch knob clockwise to decrease pressure.
2. Turn pressure switch knob counter clockwise to increase pressure.



11.6 Absolute Pressure Transducer

The control unit is fitted with three pressure transducers, one for the control and monitoring of chamber pressure, the second for the control of jacket pressure and the third for gasket pressure.

The transducer type IMT 3296 is a membrane pressure sensor and electronic measuring circuit, having the following specifications:

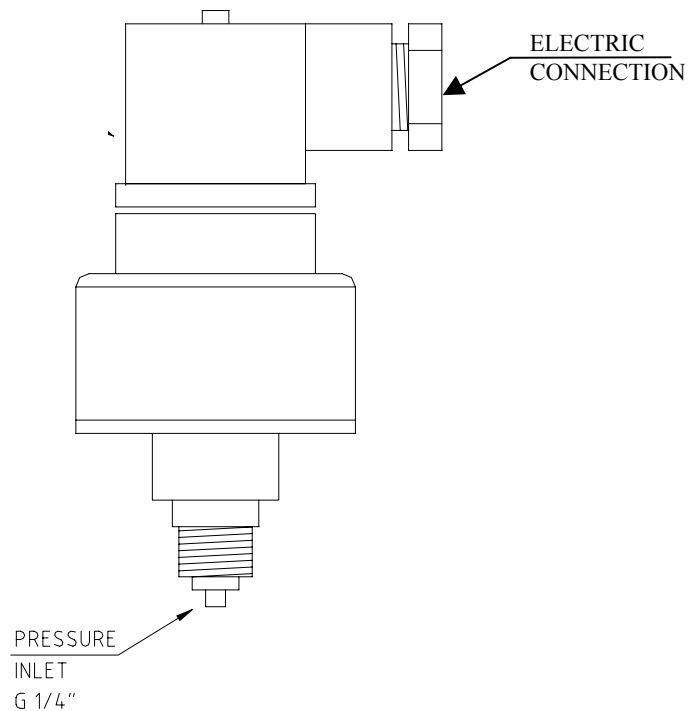
Pressure gauge: 0-4bar abs.

Output span current: 4-20mA

Supply voltage: 10V to 30V

The pressure of the steam to the gasket should be 3 bars (45 psi), but the transducer is set at 1.5 bars (22 psi).

The terminals at the connector of the device are 1 (+24V) and 2 (OUT) to the controller output.



11.7 Cleaning and Replacing the Water Level Electrodes

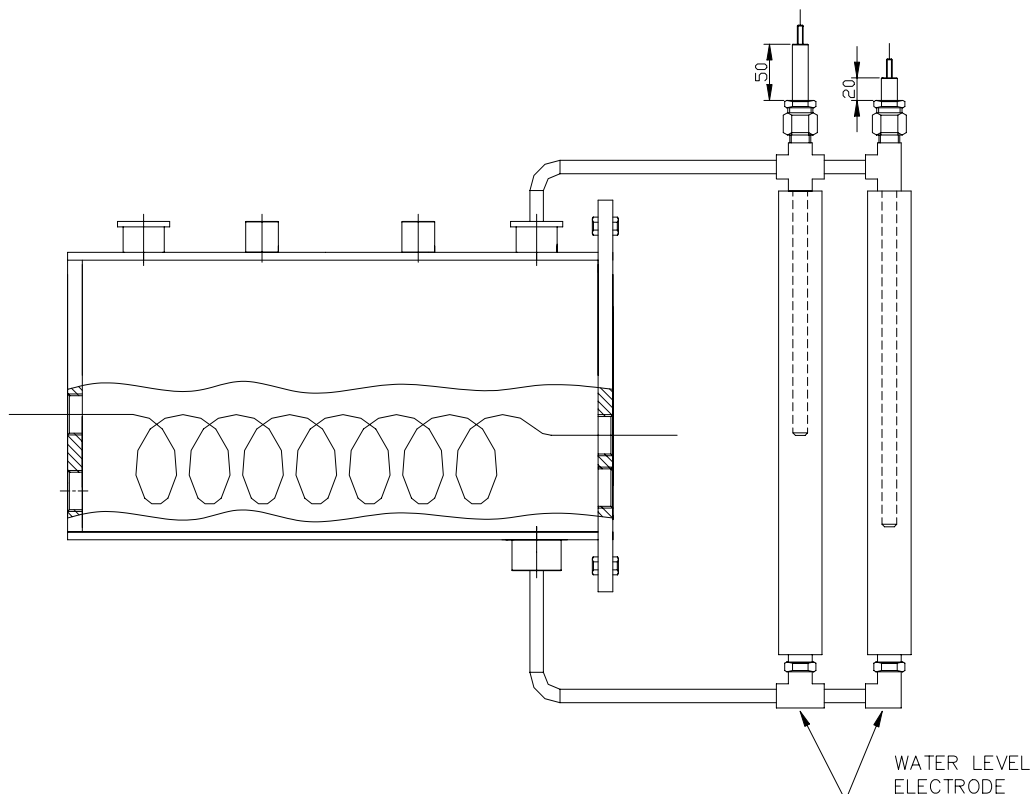
The two electrodes of the water level control system are located on top of the STS generator.

Cleaning

1. Turn off the electric power and release the steam pressure from the autoclave and the steam generator.
2. Disconnect the wire from the electrodes connections.
3. Open the nuts that tighten the electrodes.
4. Insert a new electrode and tighten the fixing bolt to avoid leakage.
5. Reconnect the wires to the electrodes

Replacing

1. Remove the two electrodes. Keep in mind the place of the short and long electrodes.
2. Clean the electrodes.
3. Reassemble the two electrodes into their places.
4. Tighten the nuts to avoid leakage.
5. Reconnect the wire to the electrodes.
6. Test the unit.



11.8 The GEN-PROTEC electronic board

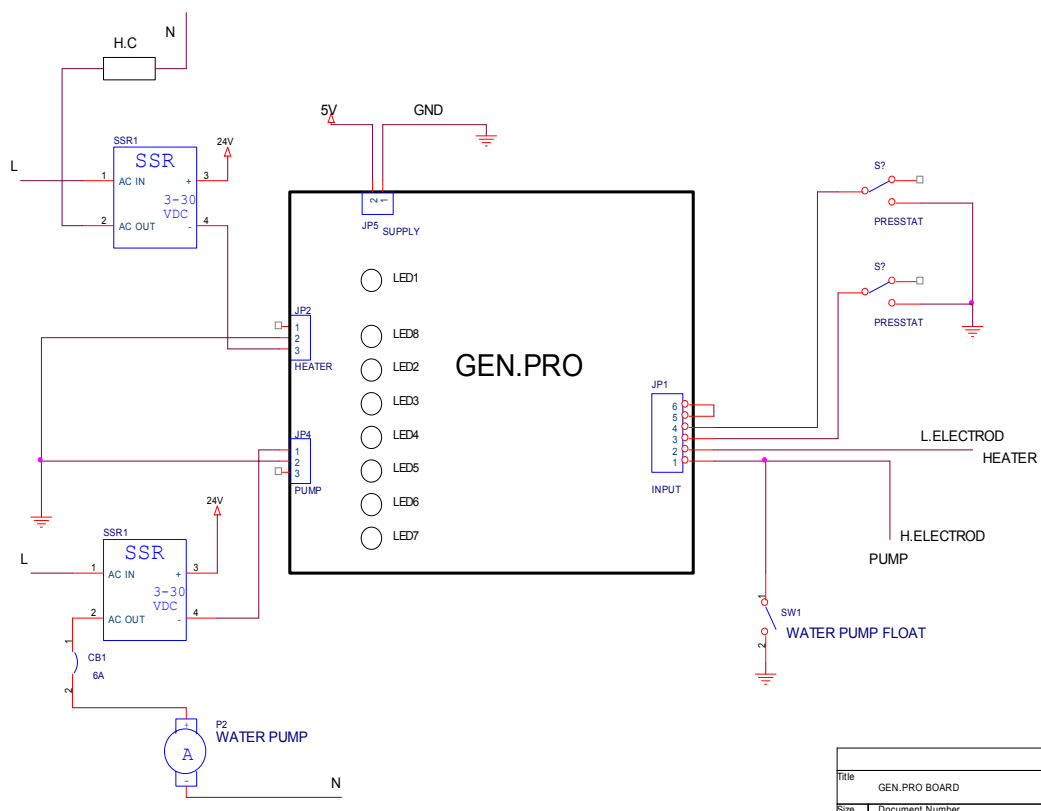
The water level control system consists of two electrodes connected to an electronic board, which commands the operation of the water pump and servo solenoid valve and switches off the heating current in case of lack of water or low water level.

The electronic board G-PROTEC -V1 receives electric signals from two electrodes of different lengths, introduced in the pressure vessel through two openings located on top of the vessel.

The short electrode determines the water level in the boiler and the long electrode determines the minimum level, necessary to ensure a safe operation of the heaters.

The steam output pressure is regulated by the pressure switch, connected to the G-PROTEC-V₁ electronic board, which switches the heating currents of the generator.

Refer below to layout and connection diagram of the electronic board G-PROTEC-V1 (only the input and output connections relevant for this system, are configured in the drawing).



11.9 Water Pump Rear Endbell Replacement Kit

WARNING:

To prevent electrical shock, disconnect power before initiating any work. In the case of pump failure, the motor housing and/or the pumped fluid may carry high voltage to components normally considered safe.

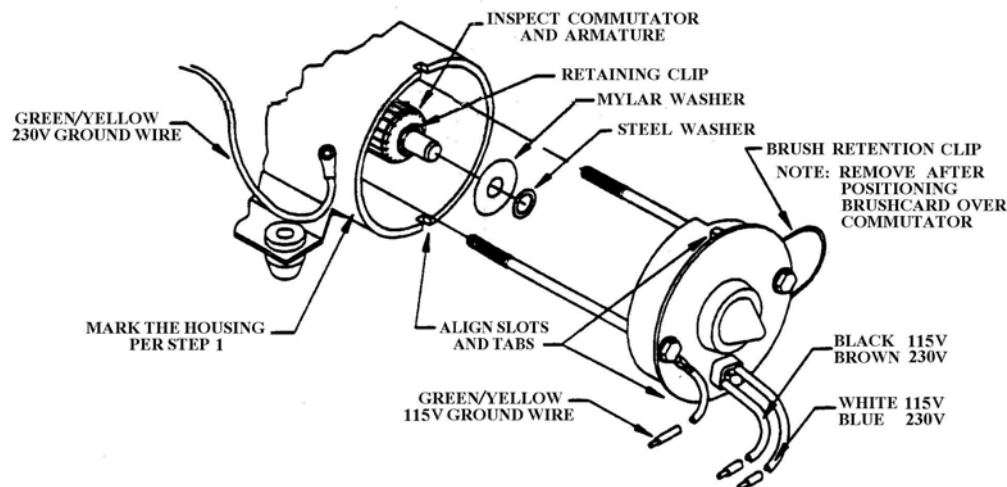
CAUTION:

If the fluid being pumped is harmful, caustic, or hazardous take all necessary precautions to prevent equipment damage or personal injury. When the procedure outlined below is performed, the fluid side of the pump-head is not opened; however, relieving pressure within the outlet side of the pump is highly recommended.

Inspect the motor armature/commutator for any indication of the following conditions.

Check the commutator brush contact surface for deep wear, scores, filled/shorted slots, or a burnt condition. Minimum commutator diameter is .850 in. [21.5 mm] (115 & 230VAC). Check armature windings for open, shorts, internal ground, and commutator connections. The windings should not be overheated, black in color, or have a burnt odor.

If the motor has any indication of the aforementioned or other failure modes, the endbell kit will not correct the failed condition. Complete motor assemblies. Contact Tuttnauer for a complete motor assembly.



11.9.1 Replacement Instructions

1. Mark the motor housing to index the location of endbell wires to the housing.

NOTE:

If the endbell is improperly indexed to the motor housing (180°) the motor will rotate in the opposite direction.

2. Remove the two motor assembly screws using a 5/16" socket wrench or nut driver.
3. Remove the rear endbell assembly. Inspect for signs of excessive wear on the commutator and/or armature. Ensure the proper placement of washers on the shaft as shown.
4. Slide the new endbell assembly onto the shaft as far as the brush retention clip will permit.

5. Index the endbell wires to mark made in step #1. Align endbell to the slots in the motor housing. Pull the brush retaining clip out while pressing the endbell flush to the motor housing.
6. Connect the black 115V (brown 230V) wire to the pump switch if applicable.
7. Install the motor assembly screws along with the green/yellow wire (115V only). Torque to 12÷18 m. lbs.
8. Perform Hi-Pot Test as follows:
 1. The system conductors must be shorted together, and all switches must be turned "on".
 2. Hi-pot voltage is applied between the shorted conductors and accessible dead metal. The voltage frequency should be within the range of 40-70 hertz.
 3. Voltage should be applied in accordance with either condition "A" or condition "B" per the table below.

	CONDITION A		CONDITION B	
Appliance Rating	Potential Volts	Time Seconds	Potential Volts	Time Seconds
Less than 100	—	—	600	1
100 – 130 volts	1000	60	1200	1
210 – 240 volts	1480	60	1780	1

11.10 Door Piston Oil Tank

11.10.1 Checking Oil Level

To check if the oil content in the tank is as required perform the following:
Open the door to the lower position.

Verify that when the door is open, the oil content in the oil tank is 80% of full capacity.

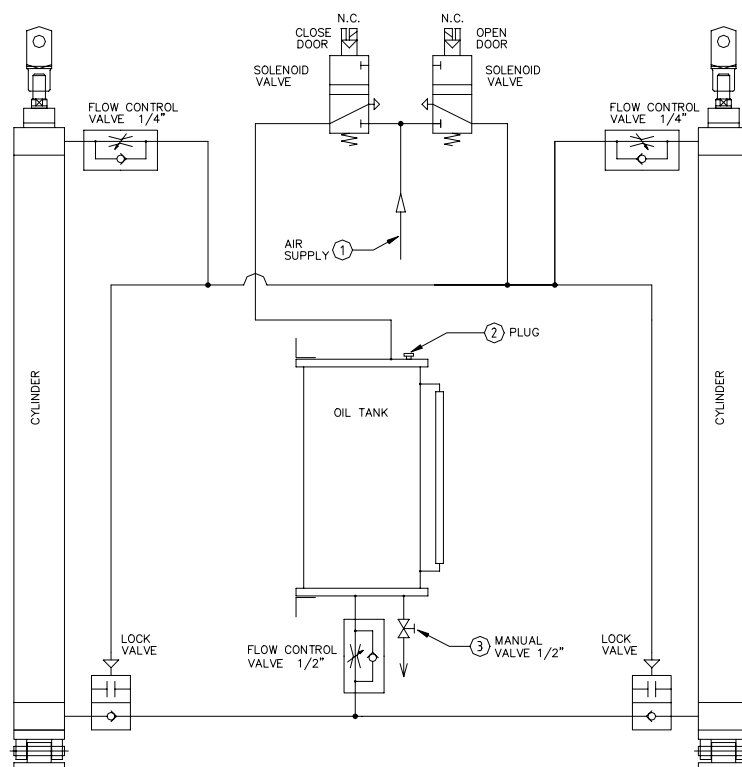
If the oil content in the tanks is below or over the required quantity add or remove oil according to the following instructions:

11.10.2 Adjusting Oil Quantity

1. When the door is in “open” position disconnect the compressed air supply to the autoclave (1).
2. Add oil through the oil filling plug (2) or remove oil from the tank using the drain manual valve (3).
3. Close well the drain valve and filling plug (as appropriate).
4. Reconnect the compressed air supply.
5. Close and open the door 5 – 10 times in order to drain air from the system.

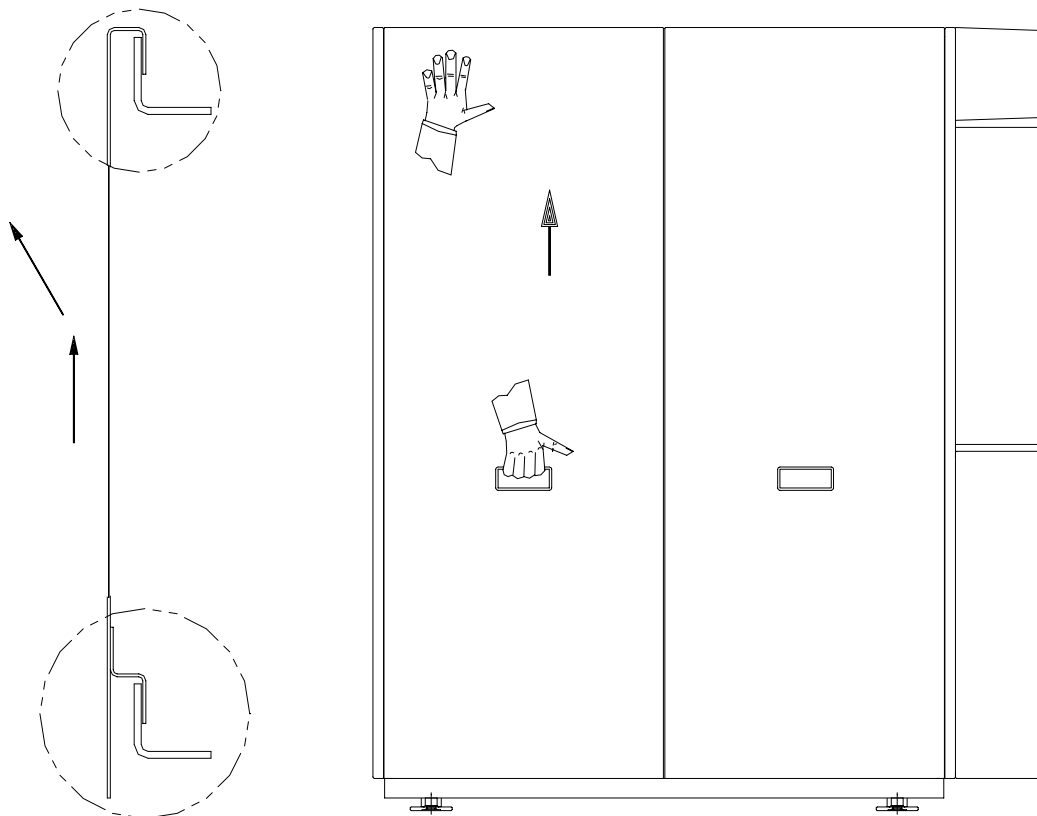
Attention:

Do not stand close to the door while reconnecting the compressed air supply to the autoclave.



11.11 Dismantling the Cabinets Side Panels

Push the side cover upward and pull out (A).



12. SPARE PARTS

	Part No.	Description
R	ARM 029 – 0001	Pressure Reducer 1/2" ADCA
R	ARM 029 – 0006	Pressure Reducer 1/2" Stainless Steel
R	ARM 100 – 0012	Steam Trap, inverted bucket 1/2", ESCO
R	ARM 100 – 0069	Steam Trap 1/2" (elbow) without bypass Nicholson N125W
R	ARM 100 – 0070	Steam Trap 1/2" (elbow) with bypass Nicholson N125W SLR
R	ARM 172 – 0004	Non return valve 'SWING' 3/4"
R	ARM 172 – 0005	Non - return valve 'SWING' 1"
R	ARM 172 – 0012	Non return valve 'Mondeo' 1/2"
R	ARM 172 – 0018	Non return valve 'SWING' 1/2" Stainless Steel
-	CTP 201 – 0002	Power Supply PU65 - 14C
-	CTP 201 – 0003	Power Supply PU30 - 10LS
-	CTP 201 – 0044	GEN-PROTEC Board
R	CTP 201 – 0065	Solid State Relay (SSR)
-	CTP 201 – 0079	Control panel CAT 2004
-	CTP 201 – 0090	HorizV5 board
-	CTP 201 – 0091	Horan R5 board
R	ELE 034 – 0018	Circuit Breaker 6A
R	ELE 035 – 0012	Main rocker switch
R	ELE 036 – 0003	M.Sw. Crouzet
-	FIL 175 – 0014	Strainer 1"
-	FIL 175 – 0023	Strainer 1/2" Stainless Steel
-	FIL 175 – 0035	Strainer 3/4" Stainless Steel
R	FIL 175 – 0039	Air Filter Domnick-Hunter 0.01 μ , 1/2"
-	FIT 100 – 0313	Fitting for water level tube
-	FIT 102 – 0296	Electrode holder
R	GAS 081 – 0004	Door Gasket 21 mm.- 26"x26"
R	GAS 082 – 0005	Glass Tube Gasket
	GAS 084 – 0018	Reinforced flexible tube 1/2"
R	GAU 029 – 0001	Pressure Gauge - 1+60 Psi
R	GAU 029 – 0003	Pressure Gauge 0-60 Psi
R	GAU 029 – 0012	Air pressure gauge 1/4"
-	GAU 029 – 0018	Main air pressure reducer MAFR 200 8A
-	GAU 029 – 0028	Secondary air pressure reducer MAR 200 8A
R	GEN 350 – 0011	Water Level Electrode (long)
R	GEN 350 – 0012	Water Level Electrode (short)
R	GLA 028 – 0002	Water level glass tube
R	PNE 100 – 0006	Short Teflon sleeve
-	PNE 100 – 0007	Electrode nut
-	PNE 195 – 0022	Non return valve 1/8"
-	PNE 195 – 0024	Locking valve

	Part No.	Description
-	PNE 195 – 0028	Flow control valve 1/2"
-	PNE 195 – 0029	Speed regulator EAS2200-F02
-	PNE 195 – 0038	Oil tank
-	PNE 195 – 0039	Silencer 1/8"
-	PNE 195 – 0041	Silencer 1/2"
-	PNE 195 – 0047	Air cylinder ISO 50/770
R	PNE 195 – 0051	Kit for cylinder - Viton
-	PNE 195 – 0052	Piston rod end
-	PNE 195 – 0053	Rear cylinder connection
-	PUM 056 – 0003	Ejector 1"
-	PUM 056 – 0011	Water Pump, 'Shurflo'
R	PUM 056 – 0020	Water pump rear endbell replacement kit
R	RES 075 – 0009	Water level float
-	SOL 026 – 0001	Solenoid Valve 1.6 X 1/4 N.C.
R	SVL 029 – 0031	Safety valve 'SPENCE' 1/2" x 40psi
R	SVL 029 – 0036	Safety Valve 'HEROSE' 1/2" x 40psi
R	THE 002 – 0003	Printer paper
-	THE 002 – 0005	Printer DPU 20
-	THE 003 – 0004	Double temperature sensor PT100
-	THE 003 – 0006	Temperature sensor PT100x100
-	THE 005 – 0005	Pressure Switch RT200
-	THE 006 – 0006	Pressure transducer 0-4 bar abs.(IMT 3296)
-	THE 007 – 0001	Low Water Level Switch
-	VLV 170 – 0001	Manual valve 1/2"
-	VLV 170 – 0002	Manual valve 3/4"
-	VLV 170 – 0016	Valve set for water level tube
-	VLV 170 – 0022	Needle valve 1/4" Stainless Steel
-	VLV 170 – 0039	Manual valve 1/2"
-	VLV 170 – 0050	Manual valve 1/2" Stainless Steel
-	VLV 170 – 0051	Manual valve 3/4" Stainless Steel
-	VLV 170 - 0055	Manual mini ball point valve 1/4"
-	VLV 170 – 0087	Air-operated valve 1/2"
-	VLV 170 – 0088	Air-operated valve 3/4" Stainless Steel
-	VLV 170 – 0089	Air-operated valve 1" Stainless Steel
-	VLV 170 – 0091	Air-operated valve 1/2" Stainless Steel
-	VLV 170 – 0327	Air-operated, spring returned valve 1/2" ASCO
-	VLV 170 – 0328	Air-operated, spring returned valve 3/4" ASCO
R	VLV 171 – 0001	Replacement kit for air-operated valve 1/2"
R	VLV 171 – 0002	Replacement kit for air-operated valve 3/4"
R	VLV 171 – 0003	Replacement kit for air-operated valve 1"
-	WIR 040 – 0070	Flat cable –34 wires

R- Recommended spare parts list (to be maintained by the operator)

13. VALVES NUMBERING

The valves in the drawing and the manual are numbered according to their function. The following list includes all the valve numbers that are in use in Tuttnauer.

0.	FUNCTION	01. Change-over : steam / electricity 02. Locking door cylinder (front door) 03. Locking door cylinder (Rear door)
1.	FEED WATER	11. Feed water – cool jacket 12. Feed water – cool heat exchanger 13. Feed water – cool fast exhaust 14. Feed water – to reservoir 15. feed water – to vacuum pump/ ejector 16. Water outlet 17. Shut 18. Feed water – to air detector
2.	MINERAL FREE WATER	21. Mineral free water - inlet 22. Detergent 23. To spray 24. Recycling inlet 25. Recycling outlet
3.	COMPRESSED AIR	31. Air inlet 32. Air inlet - to chamber 33. To splash cooling pipe 34-1. To door 1 seal 34-2. To door 2 seal 38-1. Open door 1 38-2. Open door 2 39-1. Close door 1 39-2. Close door 2
4.	AIR	41. Air release N.C. 42. Air release N.O. 43. Filtered air - inlet 44. Air Inlet 45. Air Leak Test

5.	VACUUM	51. Vacuum - break 52. Vacuum - to pump 53-1. Vacuum - from door 1 seal 53-2. Vacuum - from door 2 seal
6.	DRAIN	61. Drain – from reservoir 62. Drain – from jacket overflow 63. Drain – from vacuum pump / ejector 64. Drain – from chamber 65. Drain – from cooler 66. Drain – from sanitary filter 67. Drain – from steam generator 68. Drain – jacket 69. Drain – condense from seal
7.	EXHAUST	70. Exhaust – from chamber 71. Exhaust – to reservoir 72. Exhaust – to drain 73. Fast exhaust 74. Slow exhaust 75. Exhaust to ejector / to vacuum pump 76. Exhaust – from heat exchanger 77. Exhaust – from steam generator 78. Exhaust through heat exchanger (pre-vacuum stage only) 79. Jacket steam trap
8.	GAS	81. Inlet 82. Main inlet 83. Inlet through humidifier
9.	STEAM	90. Steam – from building source 91. Steam – to jacket (From outer source) 92. Steam – inlet 93. Steam – to chamber 94-1. Steam – to door 1 seal 94-2. Steam – to door 2 seal 95. Steam – to heat exchanger 96. Steam – to sanitary filter 97. Steam – from steam generator 98. Steam – to activate ejector 99. Steam – to air detector

NOTE: S- SANITARY VALVE.

14. Pressure and Temperature Table for Saturated Steam

$$0^{\circ}\text{C} = 32^{\circ}\text{F}$$

$$10^{\circ}\text{C} = 50^{\circ}\text{F}$$

$$20^{\circ}\text{C} = 68^{\circ}\text{F}$$

$$30^{\circ}\text{C} = 86^{\circ}\text{F}$$

$$40^{\circ}\text{C} = 104^{\circ}\text{F}$$

$$50^{\circ}\text{C} = 122^{\circ}\text{F}$$

$$60^{\circ}\text{C} = 140^{\circ}\text{F}$$

$$70^{\circ}\text{C} = 158^{\circ}\text{F}$$

$$80^{\circ}\text{C} = 176^{\circ}\text{F}$$

$$90^{\circ}\text{C} = 194^{\circ}\text{F}$$

$$100^{\circ}\text{C} = 212^{\circ}\text{F}$$

$$110^{\circ}\text{C} = 230^{\circ}\text{F}$$

$$120^{\circ}\text{C} = 248^{\circ}\text{F}$$

$$130^{\circ}\text{C} = 266^{\circ}\text{F}$$

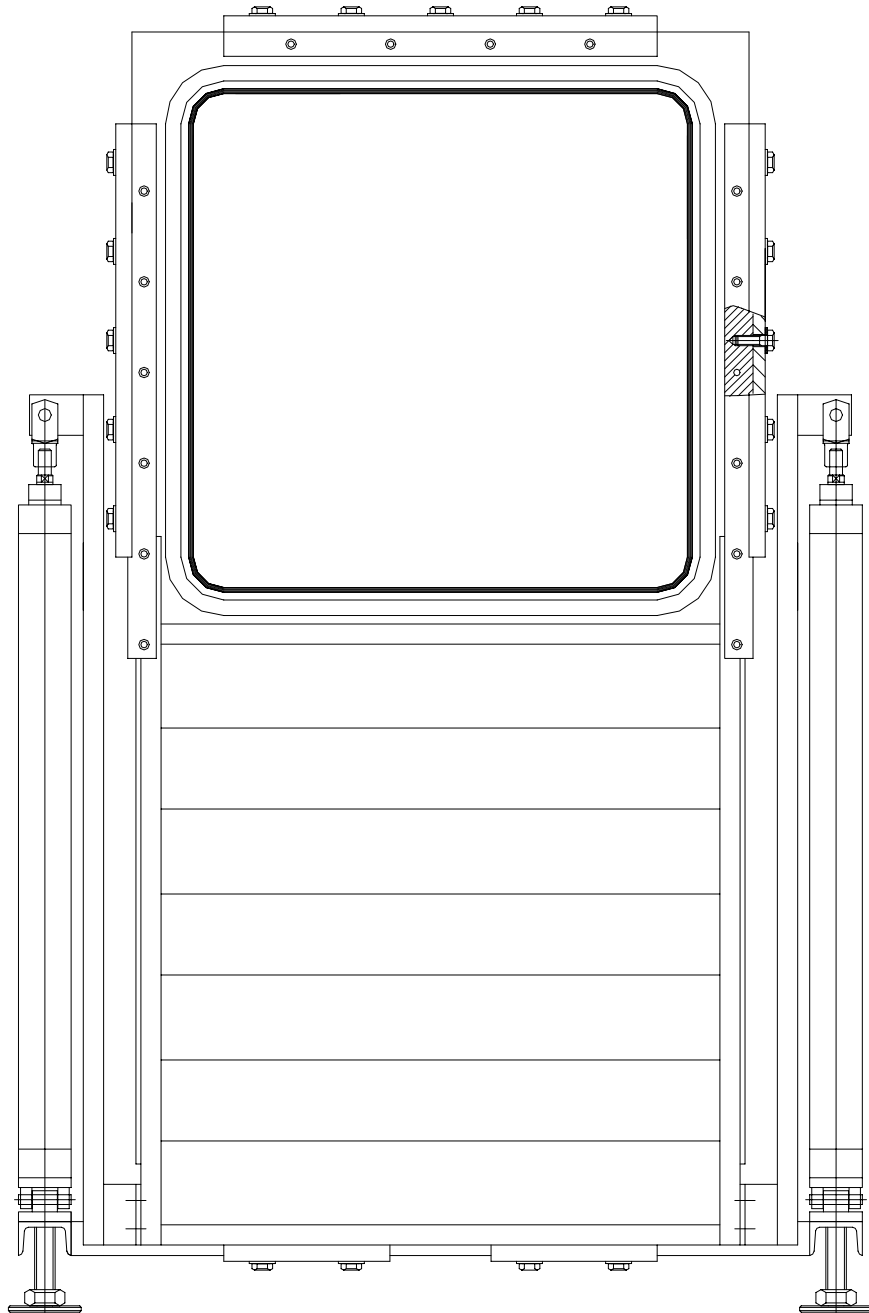
$$140^{\circ}\text{C} = 284^{\circ}\text{F}$$

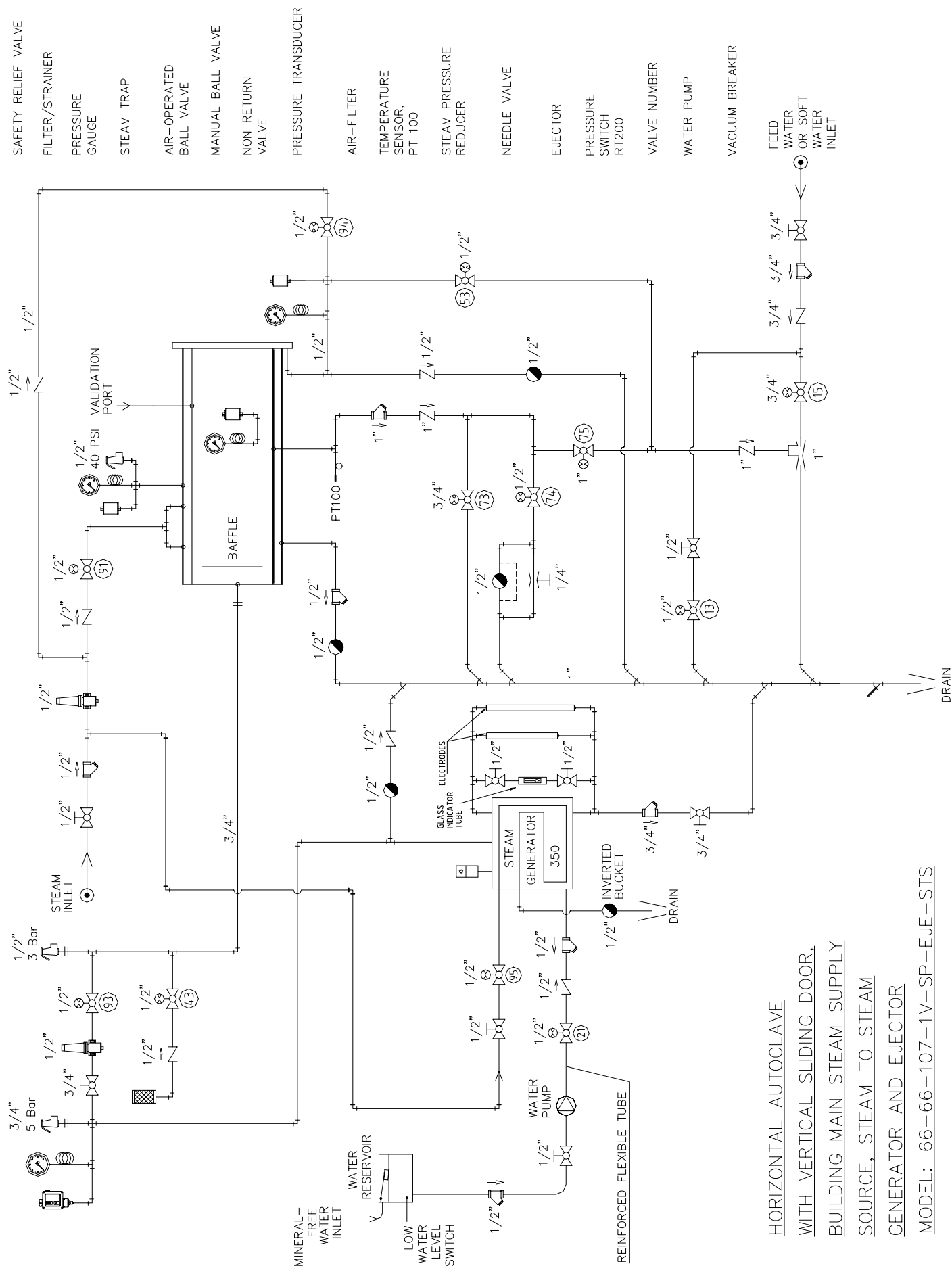
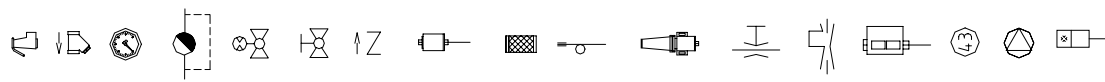
$$150^{\circ}\text{C} = 302^{\circ}\text{F}$$

psia	psig	°F	kPa	°C
30.0	15.3	250.0	205.3	121.1
30.1	15.4	250.2	206	121.2
30.2	15.5	250.3	206.6	121.3
30.3	15.6	250.5	207.3	121.4
30.3	15.6	250.7	207.9	121.5
30.5	15.8	250.9	208.6	121.6
30.5	15.8	251.1	209.2	121.7
30.6	15.9	251.2	209.9	121.8
30.7	16.0	251.4	210.5	121.9
30.8	16.1	251.6	211.2	122.0
31.0	16.2	251.8	211.9	122.1
31.0	16.3	252.0	212.5	122.2
31.1	16.4	252.1	213.2	122.3
31.2	16.5	252.3	213.9	122.4
31.3	16.6	252.5	214.5	122.5
31.4	16.7	252.7	215.2	122.6
31.5	16.8	252.9	215.9	122.7
31.6	16.9	253.0	216.6	122.8
31.7	17.0	253.2	217.2	122.9
31.8	17.1	253.4	217.9	123.0
44.3	29.6	273.2	304.2	134.0
44.4	29.7	273.4	305.1	134.1
44.6	29.9	273.6	306.0	134.2
44.7	30.0	273.7	306.9	134.3
44.8	30.1	273.9	307.8	134.4
45.0	30.3	274.1	308.7	134.5
45.1	30.4	274.3	309.6	134.6
45.2	30.5	274.5	310.5	134.7
45.4	30.7	274.6	311.4	134.8
45.5	30.8	274.8	312.4	134.9
45.6	30.9	275.0	313.3	135.0
45.8	31.1	275.2	314.2	135.1
45.9	31.2	275.4	315.1	135.2
46.0	31.3	275.5	316.0	135.3
46.2	31.5	275.7	317.0	135.4
46.3	31.6	275.9	317.9	135.5
46.4	31.7	276.1	318.8	135.6
46.6	31.9	276.2	319.7	135.7
46.7	32.0	276.4	320.7	135.8
46.8	32.1	276.6	321.6	135.9
47.0	32.3	276.8	322.6	136.0
47.1	32.4	277.0	323.5	136.1
47.3	32.6	277.2	324.5	136.2
47.4	32.7	277.3	325.4	136.3
47.5	32.8	277.5	326.3	136.4
47.7	33.0	277.7	327.3	136.5
47.8	33.1	277.9	328.3	136.6
47.9	33.2	278.1	329.2	136.7
48.0	33.4	278.2	330.2	136.8
48.2	33.5	278.4	331.1	136.9

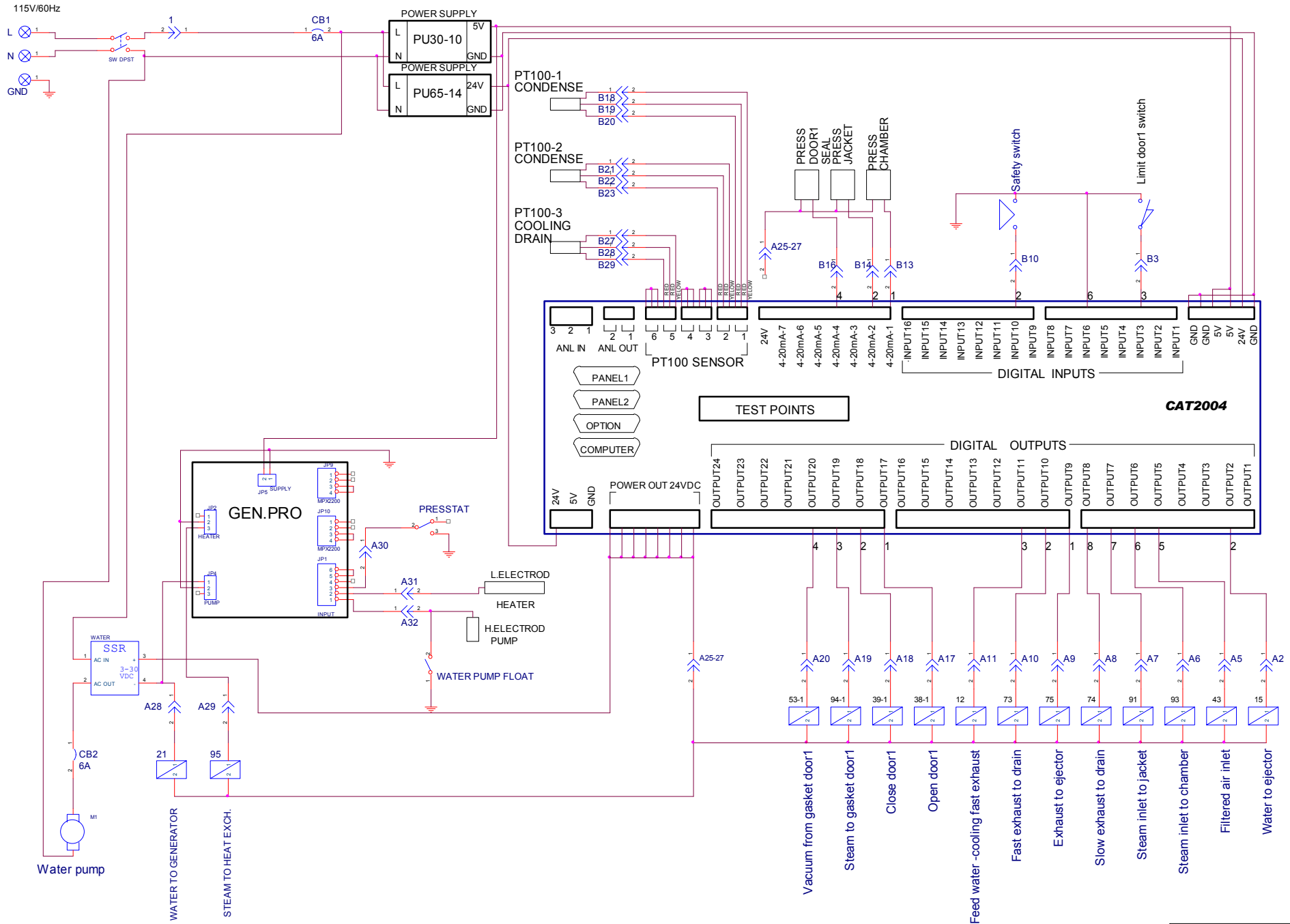
psia = Absolute scale
 psig = Atmospheric scale
 KPa = Pascal absolute scale

VERTICAL SLIDING DOOR





HORIZONTAL AUTOCLAVE
WITH VERTICAL SLIDING DOOR,
BUILDING MAIN STEAM SUPPLY
SOURCE, STEAM TO STEAM
GENERATOR AND EJECTOR
MODEL: 66-66-107-1V-SP-EJE-STs



XPCS Manual

Definitions

PC – Personal computer.

Program – a complete, self-contained set of computer instructions that you use to perform a specific task such as word processing, accounting or data management. Program is also called Application.

PCS – Cat Technologies LTD. code development, controlling and communication technology.

PCS Target platform – Cat Technologies LTD. controlling system based on PCS card.

PCS communication – exchange data between PCS components via RS232 or RS485, using PCS data exchange protocol.

Download – Send data to the hardware target platform.

Upload – Retrieve data from the hardware target platform.

Calibration - adjusting analog input presentation value by changing gain and offset values.

Overview

XPCS is a Data exchange program that lets you perform downloading of PCS code, downloading/uploading analog inputs gain and offset values. The program using PCS communication module, to connect between target platform and PC.

XPCS Aim

- Download PCS code data.
- Calibration.

Minimum Requirements

- Pentium processor or equivalent.
- 32MB of RAM, 32 MB of free hard drive space.
- CD-ROM drive.
- Available serial communication port.
- Windows 9X/NT 4.

User Requirements

To operate this program, user needs a basic knowledge of PCS.

Installation

- Select the CD drive by double click on him.
- When the window open find and double click on the file "setup.exe"
- This will launch the installer, follow the on screen instructions.

Using XPCS

Configuring the program

On 'XPCS' main window, press 'Options' button. 'Options' window will be displayed.

Connection Config	
Port Number	2
Baudrate	19200
Wait loop	10000
Address	1

Modem Config	
<input checked="" type="checkbox"/> Active	
Dial Timeout	40
Connection Timeout	5
Phone Number	96581667

Download settings

☒ Get and Set Gain_Offset

☒ Get and Set Parameters

OK

Cancel

Configuring communication settings

In 'Port Number' text box type serial port number connected to the PCS Target platform, or modem port number to remotely connection.

In 'Baudrate' text box type the PCS Target platform baud rate. Usually the value is: 19200.

'Wait loop' is a communication time error counter. To fix communication problems with remote targets via modem, try to insert greater value.

In 'Address' text box, insert the PCS Target address.

Modem Configurations

To connect to the remote target via a modem, select 'Active' check box in 'Modem Config' frame.

'Connection Timeout' is the waiting time in seconds to requested data form the PCS target platform. If no data is retrieved from the target after the waiting time, the program generates a communication time error.

'Dial Time Out' is a waiting time in seconds to be used by the local modem trying to connect to the remote modem. After this time has elapsed, the program generates a timeout error.

'Phone Number' is the phone number dialed to.

Download Setting configuration

If 'Get and set Gain Offset' checked, when program performing download, all gain and offset values will be stored before PCS code downloading, and restored after downloading is completed.

If 'Get and Set Parameters' checked, when program performing download, all parameters will be stored before PCS code downloading and restored after downloading is completed.

Note: The program stores parameters only in these conditions:

- **CAT Technologies ADMC Program Installed on PC.**
- **The Downloaded file (DWN) has the same name as one of the ADMC type files (for example if downloaded file name is: LabTN2.DWN, the ADMC file is compatible, because ADMC type file: LabTN2.mdb exist).**

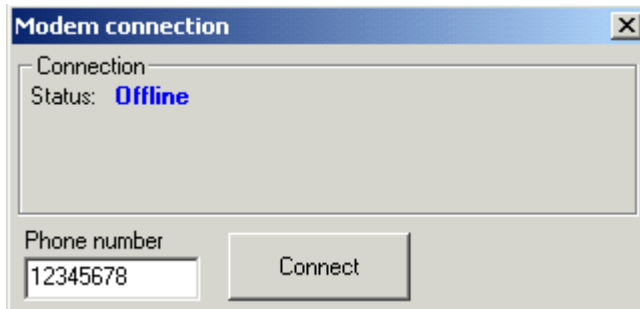
Note: Only current selected Program (For example: 1-Instruments) parameters will be saved and restored.

Note: Because the PCS target platform parameters saving process are complex, restoring Parameters task takes long time (few minutes)!

Note: There is no need to edit options every time that the program starts running. The program saves the settings by pressing the 'OK' button and starts up with the last settings.

Connecting to the PCS Target platform

The program can be connected to the PCS Target by RS232 serial cable, or via a modem. If the program is configured to perform connection via a modem (Modem Active selected), pressing 'Go Online' button on main XPCS window will display 'Modem connection' dialog box:



By pressing 'Connect' button, the program will try to connect to the remote PCS Target. Opening connection between remote PCS Target and PC, performs the following tasks:

- Check if COM Port is available.
- Detect modem.
- Dial a phone number.
- Wait for connection establishment.
- Check if remote target platforms are connected.

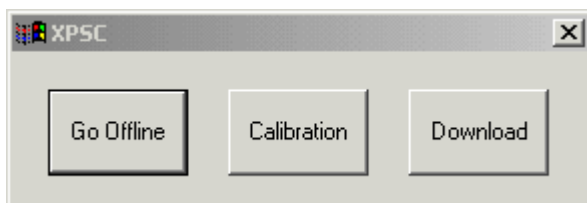
If one of the tasks fails, the program will abort connection process and will display relevant error message.

If 'Modem active' option is not selected, by pressing 'Connect' button, the program will open communication port. In this case, communication establishment tasks will be:

- Check if COM Port is available.
- Open COM Port.

Note: In this case the program is not checking if target platform is connected.

After connection was established, the main XPCS window will be displayed.



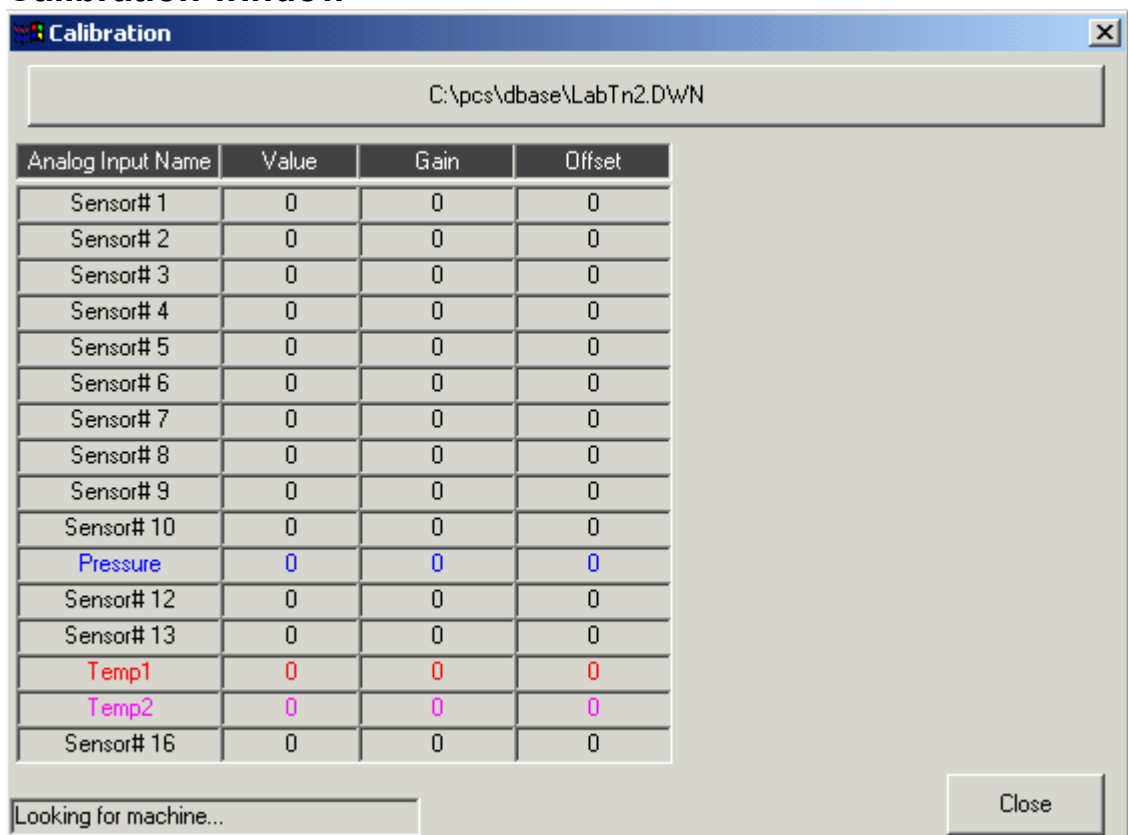
When program is online, buttons 'Go offline', 'Calibration', 'Download' will be displayed.

Pressing 'Go Offline' button will close current connection and buttons 'Go Online', 'Options' and 'Database' will be displayed on the main XPCS window:



Pressing 'Calibration' button will display 'Calibration' window.
Pressing 'Download' button will display 'Download' window.

Calibration window



The calibration window will try to connect with the PCS Target platform. The connection tasks are:

- Check if target is connected. In the status bar "Looking for machine..." is displayed.
- Upload all 16 Analog inputs gain and offset values. In the status bar "Uploading Gain & Offset..." is displayed.
- Uploading analog inputs values. In the status bar "Connected" is displayed. This task is performed periodically every 500 milliseconds. This allows real time refreshing of the analog inputs values.

Type File button

This button enables to select target type file (e.g. in the calibration window below, the file is: "C:\pcs\dbase\LabTn2.DWN"). Pressing this button will display 'Open file' dialog box. If the program will find a file with the same name in ADMC directory, in the Inputs table, the Analog inputs names will be displayed in color.

When the program is connected, by double clicking on one of the input table rows, the program will display the calibration tool. With this tool you can calibrate the selected analog input.

The Calibration window displays a table of analog inputs and their calibration parameters. The table has four columns: Analog Input Name, Value, Gain, and Offset. The inputs are Sensor# 1 through Sensor# 16, Pressure, Temp1, Temp2, and Sensor# 16. The values are 0, 130.8, 0, 0, 0, 0, 0, 0, 0, 0, 0, 87.1, 0, 0, 48.9, 108.8, and 18. The gains are 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, .1192, 0, 0, .03321, .03, and .03. The offsets are 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -99, 0, 0, -11, -14, and 18. The Temp1 and Temp2 rows are highlighted in red and pink respectively. The Pressure row is highlighted in grey. The Gain and Offset values for the Pressure row are .1192 and -99. The Gain and Offset values for the Temp1 and Temp2 rows are .03321 and -11, and .03 and -14 respectively. The Gain and Offset values for the Sensor# 16 row are .03 and 18. The window also includes a text box for the file path (C:\pcs\dbase\LabTn2.DWN), a table for Min and Max values, and buttons for Upload, Download, Calculate, and Close.

Analog Input Name	Value	Gain	Offset
Sensor# 1	0	1	0
Sensor# 2	130.8	1	0
Sensor# 3	0	0	0
Sensor# 4	0	0	0
Sensor# 5	0	0	0
Sensor# 6	0	0	0
Sensor# 7	0	0	0
Sensor# 8	0	0	0
Sensor# 9	0	0	0
Sensor# 10	0	0	0
Pressure	87.1	.1192	-99
Sensor# 12	0	0	0
Sensor# 13	0	0	0
Temp1	48.9	.03321	-11
Temp2	108.8	.03	-14
Sensor# 16	18	.03	18

Gain: 0.119200, Offset: -99.000000

Min: .09, -130; Max: .15, -70

Upload, Download, Actual High: 250, Read High: 250, Actual Low: 80, Read Low: 80, Calculate, Close

Description of the Calibration tool

Gain text box – use it for manual inserting of the Gain value.

Offset text box – use it for manual inserting of the Offset value.

Min and Max – limits for gain and offset values. If the ADMC compatible type file is not found, Min and Max labels will show "N/A".

Note: When Min and Max are N/A, you must be very careful, because the gain and offset values are not limited in this case and wrong gain or offset values may be inserted.

Upload button – Press this button to upload gain and offset values from the target platform. All 16 analog inputs gain and offset values will be uploaded.

Download button – Press this button to download Gain and Offset of the current selected analog input. The values displayed in Gain and offset text boxes will be downloaded. If Inserted values are wrong, relevant error message will be displayed and download operation will be aborted.

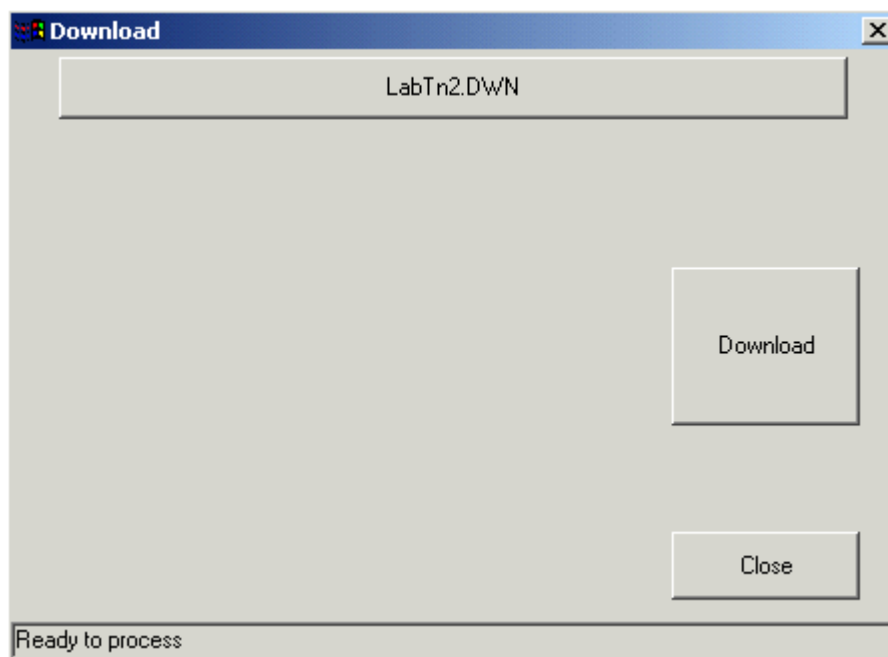
Calculation

Calculate Gain and Offset values by inserting the following 4 values: Actual High, Actual Low, Read High and Read Low to the formula. For more information about Gain and offset calculation see User Manual supplied with PCS Target platform. Pressing 'Calculate' button will calculate new Gain and Offset values. The new values will be displayed in the Gain and Offset text boxes.

Close button

Pressing this button will close 'Calibration' window and display main XPCS window.

Download window



This window enables downloading the PCS code file.

Type file button

Press this button to select the requested file to be downloaded. The PCS Downloadable file type is: *.DWN. The names of the selected file are displayed on the button.

Note: No need to select type file, if the requested file name is already displayed on the button (In the example above: "LabTn2.DWN").

Status Bar

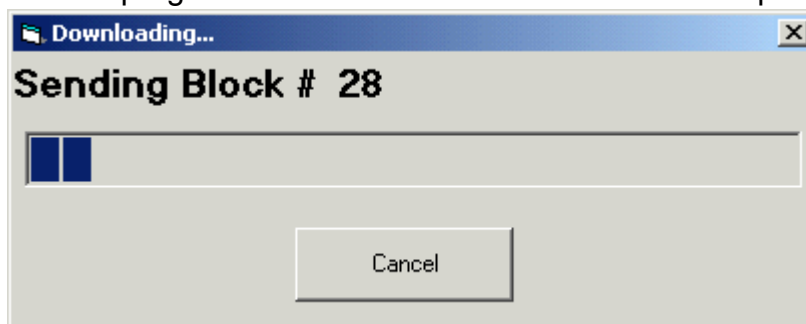
The status bar at the bottom of the window displays the current downloading process status (In the example above: "Ready to process").

'Download' Button

Press this button to perform downloading of the selected file. While performing downloading, the program will display downloading process progress messages. After downloading process is completed, the status bar will display "Download Finished".

Download Tasks

- Check if PCS Target is connected. Status message: "Looking for machine..." is displayed.
- If 'Get and Set Gain & Offset' option in 'Options' window is selected, the program will upload values of all analog inputs gain and offset. The message: "Uploading Gain and Offset..." will be displayed in the status bar.
- If 'Get and Set Parameters' option in 'Options' window is selected, and downloaded file type is ADMC compatible, the program will upload all parameters of the current selected program (e.g.: 1-instruments). The message: "Uploading Parameters..." will be displayed in the status bar.
- Download file. The program will display 'Downloading...' dialog window with progress bar and counter of the downloaded packets:

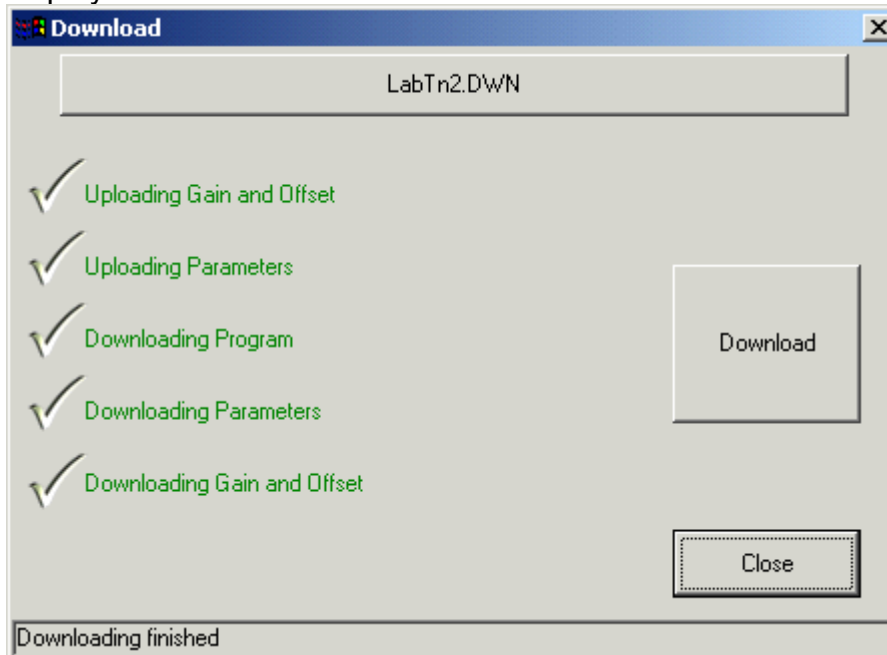


- Wait for target platform startup. After downloading of the file is completed, the PCS Target platform restarts. It takes a few seconds until the target starts running with the new code and before downloading parameters and gain/offset. The technician must wait until the target will start again to communicate with the PC. The message: "Waiting for machine startup..." will be displayed in the status bar.
- If 'Get and Set Parameters' option in 'Options' window is selected, and downloaded file type is ADMC compatible, the program will download all parameters of the current selected program (e.g.: 1-instruments). The message: "Downloading Parameters..." will be displayed in the status bar.
- If 'Get and Set Gain & Offset' option in 'Options' window is selected, the program will download values of all analog inputs gain and offset. The message: "Downloading Gain and Offset..." will be displayed in the status bar.

- When download process is completed, the message "Download Finished" will be displayed in the status bar.

Note: If error occurs during download process, relevant error message will be displayed. The message box with 'Retry' option will be displayed.

After completion of the downloading process, the download window will be displayed as follows:



Note: Upload and Download green messages of the Parameters and Gain & Offset tasks are displayed only if the relevant options were selected in the 'Options' window.

Expectable errors list



Can not upload Gain and Offset!

Description: This message may be displayed during download process, when the program is trying to upload Gain and Offset values.

Reason: Probably a communication failure between PCS Target and the PC.

Tips: Check if communication RS232 cable is connected. If it is a modem connection, check if Modem cable is connected in this case it can be that the remote modem cable is disconnected or RS232 cable between the remote modem and target platform is disconnected.



Can not upload Parameters!

Description: This message may be displayed during download process, when the program is trying to upload Parameters.

Reason: Probably a communication failure between PCS Target and the PC.

Tips: Check if communication RS232 cable is connected. If it is a modem connection, check if Modem cable is connected in this case it can be that the remote modem cable is disconnected or RS232 cable between the remote modem and the target platform is disconnected.



Fail download program!

Description: This message may be displayed during download process, when the program is trying to download the code file.

Reason: Probably a communication failure between PCS Target and the PC, or downloaded file is wrong or damaged.

Tips: 1. Check if communication RS232 cable is connected. If it is a modem connection, check if Modem cable is connected in this case it can be that the remote modem cable is disconnected or RS232 cable between the remote modem and target platform is disconnected.

2. Try to download another file.



Fail download Parameters!

Description: This message may be displayed during download process, when the program is trying to download Parameters.

Reason: Probably a communication failure between PCS Target and the PC, or PCS target platform is damaged and can not save data on flash memory.

Tips: 1. Check if communication RS232 cable is connected. If it is a modem connection, check if Modem cable is connected in this case it can be that the remote modem cable is disconnected or RS232 cable between the remote modem and target platform is disconnected.

2. Try to change the target electronic card.



Fail Downloading Gain and Offset!

Description: This message may be displayed during download process, when the program is trying to download Gain and Offset values.

Reason: Probably a communication failure between PCS Target and the PC, or PCS target platform is damaged and can not save data on flash memory.

Tips: 1. Check if communication RS232 cable is connected. If it is a modem connection, check if Modem cable is connected in this case it can be that the remote modem cable is disconnected or RS232 cable between the remote modem and target platform is disconnected.

2. Try to change the target electronic card.

**Error Opening Type file: *File Name***

Description: This message may be displayed during download process, when the program is trying to open ADMC compatible type file (*.mdb) in order to get parameters data.

Reason: The file may be damaged or used by another application.

Tips: Try to download another file. If operation succeeds, try to find what application is using the file and in the worst case, restart the PC. If the problem continues, probably the files are damaged. In this case try to replace the file with an identical file from the ADMC installation CD under 'Support' directory.

**Invalid Actual High value!****Invalid Actual Low value!****Invalid Read High value!****Invalid Read Low value!**

Description: This message is displayed when the user is trying to calculate Gain and Offset by pressing the 'Calculate' button in the 'Calibration' window.

Reason: Wrong number or non-numeric data has been inserted in one of the text boxes.

Tips: Type the right Numeric data in the text box.

**The Actual High value is not in range!****The Actual Low value is not in range!****The Read High value is not in range!****The Read Low value is not in range!**

Description: This message is displayed when the user is trying to calculate Gain and Offset by pressing the 'Calculate' button in the 'Calibration' window.

Reason: A wrong number has been inserted in one of the text boxes. A right number must be: $1 < \text{Number} < 1000$.

Tips: Type the right number that is included in the above range.

**Read High must be equal or great than Read Low!**

Description: This message is displayed when the user is trying to calculate Gain and Offset by pressing the 'Calculate' button in the 'Calibration' window.

Reason: Read High value is lees than Read Low value

Tips: Read High value must be greater than Read Low value.

**Can not calculate. Invalid values found! ...**

Description: This message is displayed when the user is trying to calculate Gain and Offset by pressing the 'Calculate' button in the 'Calibration' window.

Reason: Read High value - Read Low value = 0

Tips: Read High value must be greater than Read Low value.



The Gain value must be equal or less than ...

The Gain value must be equal or greater than ...

The Offset value must be equal or less than ...

The Offset value must be equal or greater than ...

Description: This message is displayed when the user is trying to download Gain and Offset by pressing the 'Download' button in the 'Calibration' window.

Reason: Gain or Offset value displayed in Gain or Offset text boxes are not in permitted limits.

Tips: The value in the Gain or Offset boxes must be in Min/Max limits.



Invalid Gain Value!

Invalid Offset Value!

Description: This message is displayed when the user is trying to download Gain and Offset by pressing 'Download' button in the 'Calibration' window.

Reason: Probably the Gain or Offset value displayed in Gain or Offset text boxes are not numeric data.

Tips: Type numeric value in Gain or Offset text boxes.



Illegal Port number: ...

Description: This message is displayed when the user is pressing the 'OK' button in the 'Options' window.

Reason: Wrong port number is inserted.

Tips: Type value: 0>VAL>17 in 'Port Number' text box.



Illegal Baudrate: ...

Description: This message is displayed when the user is pressing 'OK' button in the 'Options' window.

Reason: Wrong Baud rate is inserted.

Tips: Type values 9600 or 19200 in 'Baudrate' text box.



Illegal Wait Loop value: ...

Description: This message is displayed when the user is pressing 'OK' button in the 'Options' window.

Reason: Wrong Wait Loop value is inserted.

Tips: Type numeric value in 'Wait Loop' text box.



Illegal Autoclave Address:

Description: This message is displayed when the user is pressing 'OK' button in the 'Options' window.

Reason: Wrong Address value is inserted.

Tips: Type numeric value: 0<VAL<17.



Illegal Dial Timeout:

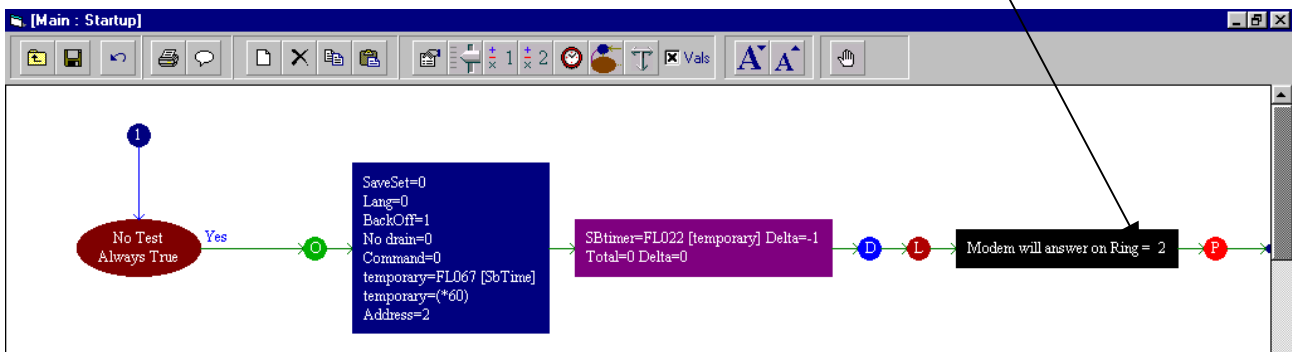
Description: This message is displayed when the user is pressing 'OK' button in the 'Options' window.

Reason: Wrong Dial Timeout value is inserted.

Tips: Type numeric value.

Steps for the Modem Connection

1. Make sure, that the downloading program includes Modem Auto answer command determination. (Main>>Startup>>First Row)



2. Connect RS232 to Modem Converter according the following diagram .
3. Check the Jumpers State according RS232 communication.
4. Turn On the Modem.
5. Turn On the Autoclave.
6. The System is ready to be connected by Modem.

